ROADS AND STREETS
HIGHWAYS
AIRFIELDS
HEAVY CONSTRUCTION
MAY 1952

How **THE BE-GE MANUFACTURING COMPANY** mounts Timken tapered roller bearings in the wheels of its Speedhaul scraper.

Scrapes and hauls 13-yard load

with help of TIMKEN® bearings

THIS Be-Ge Model ST-85130 Speedhaul scraper can scrape and haul a 13-yard load of dirt. To keep it on the job with less time out for maintenance and lubrication, The Be-Ge Mfg. Co., Gilroy, Calif., mounts the wheels on Timken® tapered roller bearings.

Be-Ge has found that closures are more effective because Timken bearings keep housing and shaft concentric. Dirt, mud and water are kept out—lubricant is kept in. Lubrication and maintenance time are reduced, scrapers are ready to go when needed.

Due to line contact between the rollers and races, Timken bearings have the tremendous load-carrying capacity needed for heavy-duty scrapers. The tapered construction of Timken bearings enables them to take radial and thrust loads in any combination. And friction is practically eliminated because of the incredibly smooth surface finish and true rolling motion of Timken bearings.

No other bearing gives you *all* the advantages you get with Timken tapered roller bearings. Make sure you have them in all the equipment you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

AVERAGE 20 MILES PER HOUR

Note the extra high apron lift of the TS300 for dumping bulky heavy materials.

MOVING RIPPED BLACK TOP

for

Weldon Zaske Construction Company
Danube, Minnesota

MOVING 18,000 yards of ripped up black top at a 20 MPH clip is typical of the speedy performance of LPC TS300 Motor Scrapers. When County Road 22, four miles north of St. Peter, Minnesota, had to be ripped up and stockpiled for re-use, Weldon Zaske of Danube used two Motor Scrapers to speed the job. Large, heaping loads of the bulky material were picked up in 45 seconds in a distance of 60 feet, and on the one mile haul to the stockpile, the rigs *averaged 20 miles per hour!* Loads were ejected in 15 seconds.

This example of the TS 300's productive speed is just one of the reasons why so many contractors like Weldon Zaske are choosing LaPlant-Choate Motor Scrapers to set the pace on the toughest jobs.

CHECK THESE OTHER BIG-PRODUCTION FEATURES

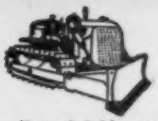
- **BIG CAPACITY** . . . 14-cu. yds. struck and 18-cu. yds. heaped, to haul bigger payloads
- **HIGH SPEED** . . . over 22 mph, assures lower average cycle time
- **BIG POWER** . . . your choice of a 280 HP Buda or a 275 HP Cummins diesel for fast acceleration and extra power when you need it
- **EASY LOADING CHARACTERISTICS** cut more valuable seconds off your cycle time
- **EXTRA HIGH APRON LIFT** and positive forced ejection mean faster, smoother spreading

LaPLANT CHOATE

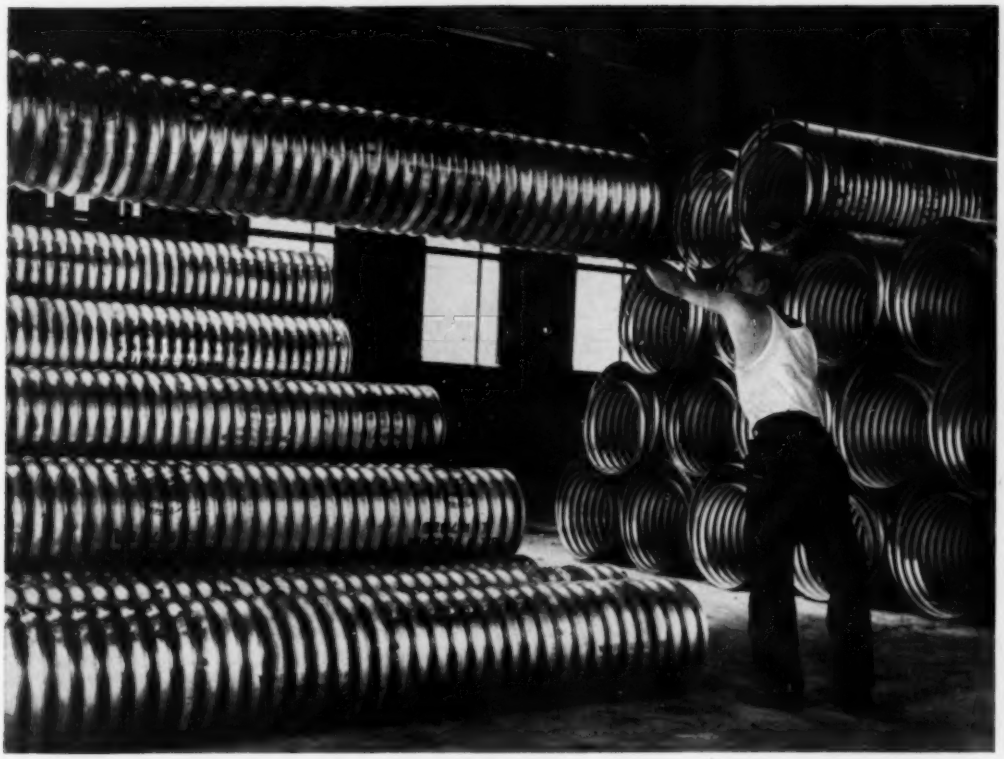
MANUFACTURING CO., INC. ® CEDAR RAPIDS, IOWA, U. S. A.

Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of track-type tractors.

2- and 4-yd. Scrapers for track-type and rubber-tired industrial tractors.



Hydraulic and Cable-operated Dozers.



Galvanized Steel Culvert Pipe

★ LOW COST ★ LIGHT WEIGHT ★ LONG SECTIONS

Culvert or drainage pipe made of galvanized sheet steel has a combination of advantages found in no other kind. It is low in price; it is light in weight; and it is fabricated in long sections.

★ The low price assures a substantial saving over pipe fabricated from other metals.

★ The light weight means that this pipe can be lifted, unloaded and laid using ordinary equipment.

★ The long sections mean a reduction in the field joints needed.

In addition, pipe made from galvanized steel sheet is not brittle. It is flexible enough to withstand deformation without breaking. It has ample strength to resist cracking where grades are not uniform.

Bethlehem does not fabricate sheet culvert pipe, but it does manufacture the corrugated and plain sheet stock used by culvert pipe fabricators. This stock, known as Beth-Cu-Loy, is copper-bearing steel with a 2-oz zinc coating. It conforms to the rigid specifications for culvert sheets that have been written by the American Association of State Highway Officials.

Any of our sales offices will gladly give detailed information on this steel, and furnish the names of fabricators who use it.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

ROADS AND STREETS

May, 1952 • Vol. 95 • No. 5

Roads and Streets represents 60 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher ECA HALBERT P. GILLETTE, Editor-in-Chief

H. J. CONWAY, Assistant Publisher

Coming Articles

Design and Construction of Oklahoma's New Turnpike

Basis of the decision on pavement type is given in detail, along with design criteria and other data on this project, which is momentarily the largest and longest U. S. road job under active construction.

New Department for Roads and Streets Readers

Traffic Control and Accident Prevention is to be the subject of feature articles in every issue—look for information on latest developments in signaling, pavement marking, street lighting, parking meters, etc., beginning in June.

140-Ft. Earth Fill for This Alabama Road

How record-height fills were constructed over large multi-plate corrugated pipe culverts, will be described soon.

Wet Weather or Not, Some Contractors Did Well

Resuming our "Knockin' out the Yardage" Department, with reports from earthmoving and paving contractors who achieved good yardage production on 1951 jobs.

A Million Square Yards of Massive Concrete

The Editor visits a southern airfield with camera and notebook—one of the bases currently being modernized for jets and heavier craft.

More New Machines for Mechanizing Roadside Work

Mr. Garmhausen will present another series of pictorial reviews on latest equipment, compiled through his Ohio work and national committee activities.

In This Issue

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundation and grade separations, and to the construction and maintenance of airports.

GILLETTE PUBLISHING COMPANY

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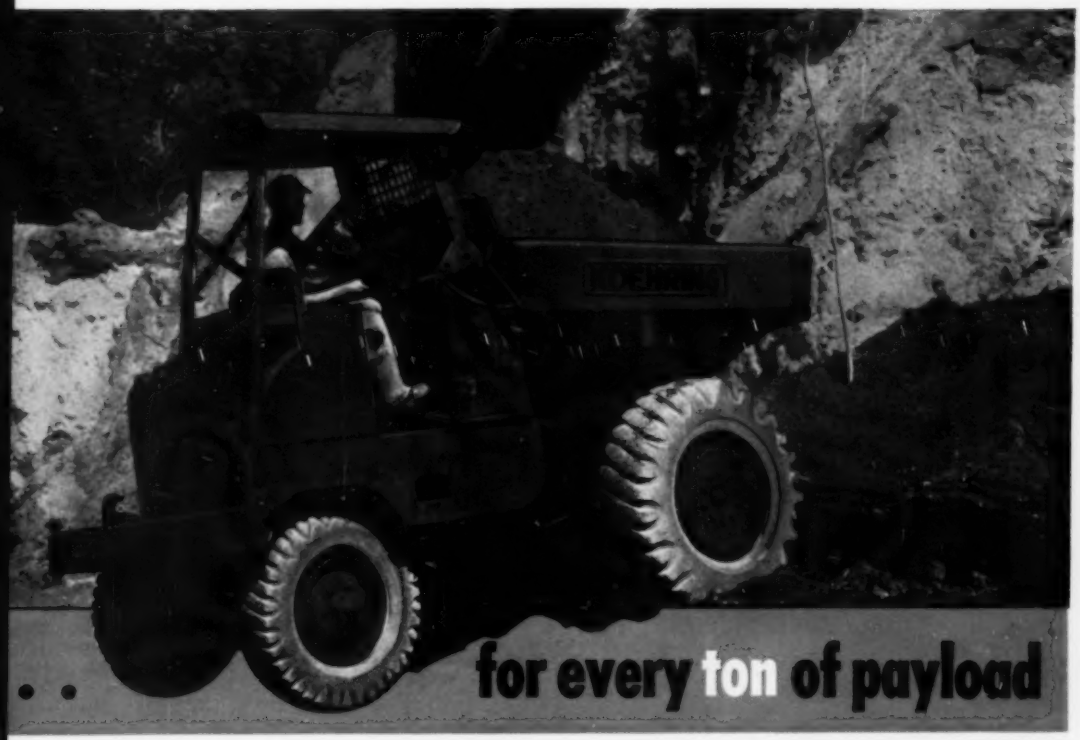
A TON OF DUMPTOR STRENGTH .

FAST, EASY SPOTTING . . . In confined underground operation, Dumptors spot fast, close to shovel . . . no need to turn. Big flared 8' x 8' body permits loading over end or sides. Shovel operator has easy-to-hit target, less spillage, short swing.

NO-TURN SHUTTLE HAUL . . . Dumptors travel same speed forward and reverse . . . save slow jockeying back and forth at the loading unit, on the haul, at the dump. Yet, Dumptors have plenty of maneuverability . . . turn in a tight circle of 19'-6" radius.



. . for every ton of payload

TO stand up under the most severe loading shocks of mine, quarry and construction service, Koehring Dumptors have more than a ton of net vehicle weight for every ton of payload. Sides, end and bottom of all-welded 6-yard body are heavily reinforced with 4" channel ribs. More than triple strength built into the bottom cushions shocks of rock loading. Seasoned 1⅝" oak timbers are securely bolted between two layers of 5/16" steel plate. Free-swinging kick-out pan adds another tough 3/16" high-manganese steel plate to Dumptor bottom for extra protection.

To withstand punishment of rough, off-road hauling, there's plenty of strength, too, in the heavy-duty chassis. Dumptor has rugged main frame of 8" ship channels, heavily trussed . . . 1-piece steel drive-axle housing and transmission case . . . 4" chrome steel drive axles . . . cast alloy steel "I" beam steering axle. There are no leaf springs . . . just one big, double-coil chassis spring on steering axle . . . none on drive axle. Big, shock-absorbing drive tires eliminate need for more. That means no spring maintenance.

For fast acceleration, less shifting, more gradeability, Dumptors also have 6 HP for every ton of gross weight . . . climb grades up to 24% fully loaded. Learn, too, how 1-second gravity dump eliminates body hoist maintenance . . . saves 15 to 25 seconds on every cycle with Dumptors. Get all the facts from your Koehring distributor.

KOEHRING Company
Milwaukee 16, Wis.

K128

KOEHRING KOEHRING HEAVY DUTY **DUMPTOR®**

SCOOPMASTER® PAVERS • EXCAVATORS • JOHNSON

"TEXACO URSA OIL X** OUR DAM WORK

Construction equipment, lubricated and fueled with Texaco, at work on the Morganza embankment, part of the flood control program on the lower Mississippi. Joint contractors are Edward E. Morgan Co., Inc., and Jones & Gillis, Inc. Dirt-moving operations, started in June, 1949, call for placing 3,985,000 cubic yards of semicompacted embankment. Equipment includes 4 draglines, 9 tractors and 53 trucks — all of which are lubricated with Texaco exclusively.

HEAVY rains slowed early stages of placing nearly four million cubic yards of embankment for the Morganza Control Structure. Construction machinery was idled for days at a time. This made it vital that, when work could be resumed, there be no delays due to equipment failure.

"Diesel engines in all our earth-movers," report the contractors, "were lubricated with *Texaco Ursa Oil X***. They ran perfectly even under the severe conditions often imposed. We found, on this as on other jobs, that *Texaco Ursa Oil X*** is a big help

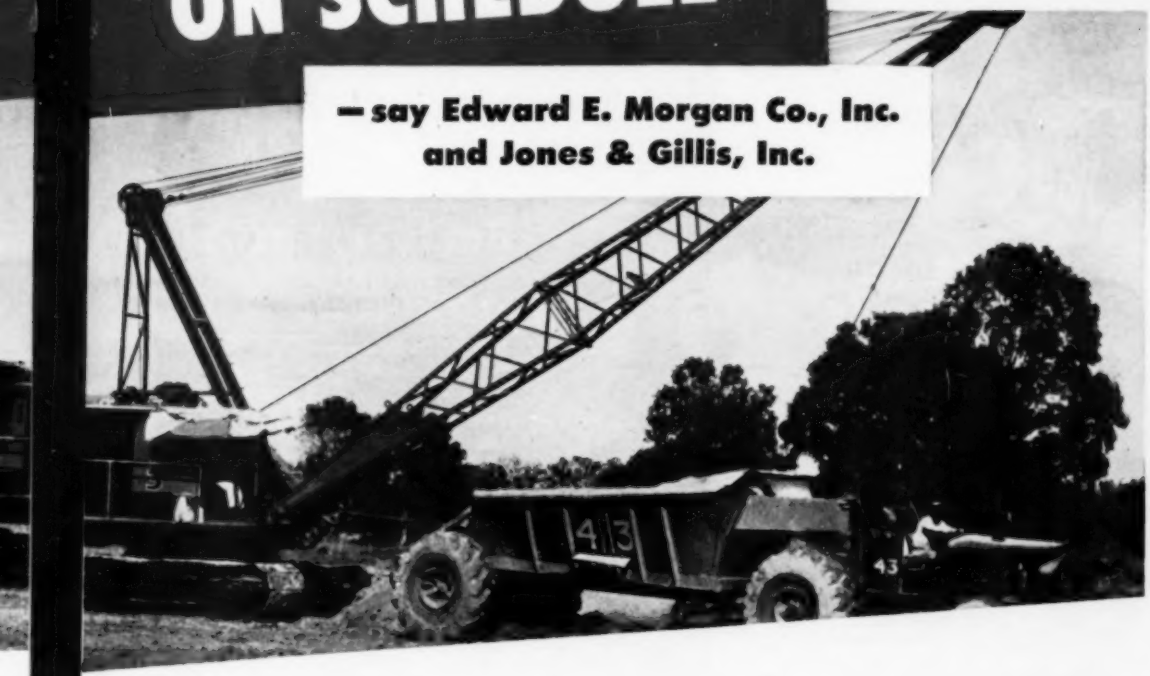
TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE** on television every Tuesday night. See newspaper for time and station.

TEXACO

TEXACO

HELPS US KEEP ON SCHEDULE"

—say Edward E. Morgan Co., Inc. and Jones & Gillis, Inc.



in reducing fuel consumption and keeping maintenance costs low."

*Texaco Ursa Oil X*** cleans as it lubricates. Its fully detergent and dispersive properties keep harmful carbon, sludge and gum from forming. Better compression and combustion result, wear is reduced, bearings are protected against corrosion. Engines run better; parts last longer.

Let a Texaco Lubrication Engineer tell you more about *Texaco Ursa Oil X*** and how you can reduce your costs with the Texaco Simplified Lubrication Plan. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Make Savings Here, Too—Chassis parts last longer when protected by *Texaco Marfak*. This super-tough lubricant guards against wear and rust in the most severe service. *More than 400 million pounds of Marfak have been sold.*

Wheel bearing maintenance cost is less when you use *Texaco Marfak Heavy Duty*. It seals itself in, seals out dirt and moisture. No seasonal change required.

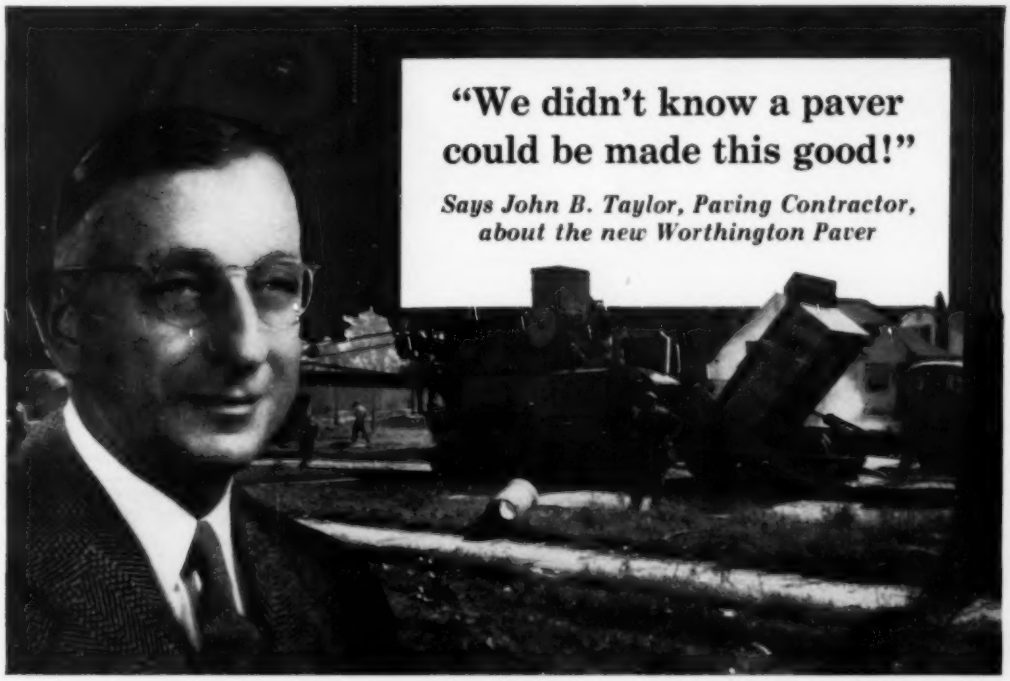
Crawler track bearings give long, trouble-free service when lubricated with *Texaco Track Roll Lubricant*. Protects against wear, dirt and moisture.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Faithfully yours 50 TEXACO *for Fifty Years*


where
SMOOTH HANDLING
is a
requirement!
IT is when smooth handling is a requirement that you find out about crane operation. When you have to balance 50 ft. of 60 in. pipe and shove it into the next section—when you have to lower a cage down a pier face for the inspector to look the concrete over—when you have to hold steel for welding or riveting, set stone or balance a concrete bucket six stories up and hit the elephant trunk, that is when you appreciate the value of smoothness of operation.
The Northwest "Feather-Touch" Clutch Control gives easier operation with freedom from the complications of delicate parts such as pumps, valves, compressors and tubing. Uniform Pressure Swing Clutches give smooth swing, reduce the danger of whipping and give increased accuracy in setting. Throttle control permits minute movements in handling the load and there is a Northwest Boom Hoist to fill every operating requirement.
These Northwest advantages mean time saved on the job and greater safety for the setters! They mean money! Why not plan to have a Northwest? Talk to a Northwest Man. It will pay you to place an order.
NORTHWEST ENGINEERING COMPANY
1504 Field Building, 135 South LaSalle Street
Chicago 3, Illinois
NORTHWEST
CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS



"SELDOM DO WE ENDORSE ANY CONSTRUCTION EQUIPMENT" begins a letter from John B. Taylor, Taylor Brothers president, pictured here on the job, ". . . but after using the new 34E . . . we feel it our responsibility to write you."

According to its president, John B. Taylor, Taylor Brothers Company, Inc., paving contractors from Birmingham, Michigan, have found that the new Worthington Model WP paver will lay more highway faster and at lower cost than any paver his company knows of.

Says Mr. Taylor: "We thought we knew about your pavers' superiority after using them for 20 years, but this new 34E beats them all."

The Taylor Company has been using its Worthington Dual Drum Paver on a paving job near Dearborn.

The new Worthington paver is the practical result of forty years of experience in building pavers and other construction equipment. Learn how it can help speed *your* paving jobs by writing for Bulletin R-1700-B7 to *Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Construction Equipment Division, Dunellen, New Jersey.*

R 2.6

If It's A Construction Job, It's A *Blue Brute* Job

WORTHINGTON
Construction Equipment

New ¾ yd. shovel, in standard-duty and heavy-duty models.

New 20 ton, heavy-duty truck crane, especially designed for long boom work.

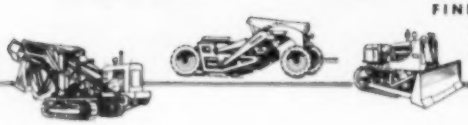
Designed to Combine These Outstanding Features . . .

- **INSTANT MANUAL CONTROLS** give a positive, smooth "feel" of the machine. Operator maintains a steady working pace.
- **POWER ACTUATED DRUM CLUTCHES** with exceptional sensitivity of control. Reduce operator fatigue, increase output.
- **DUAL RIGHT ANGLE DRIVE** connected by flexible universal couplings. Eliminates trouble factors of chain drives.
- **FLUID COUPLINGS**, offered as optional equipment, reduces shock loads — gives ultimate in smooth lift crane operation.
- **INDEPENDENT CHAIN CROWD** is powerful and positive, gets full engine power into the crowd . . . also many other features designed to insure efficiency at minimum operating expense.

GAR WOOD INDUSTRIES, INC.

FINDLAY DIVISION • EXECUTIVE OFFICES • WAYNE, MICHIGAN

Construction Equipment: Excavators, Scrapers, Dozers, Ditchers, Spreaders, Finegraders, Truck-mounted Road Graders. Truck Equipment: Dump Truck Bodies & Hoists, Winches & Cranes, Refuse Collection Bodies, Elevating End Gates.



Shovels

Gar Wood's 75 Series shovels are new to the civilian market although hundreds are in use by the armed forces . . . Three base machines are offered. The 75A, a standard duty ¾ yd. model; the 75B, heavy-duty ¾ yd. model and the 75BT, 20 ton truck crane.

All models are easily convertible *in the field* for shovel, lift crane, clam, dragline, magnet, trench-hoe and pile driver work. *Only* Gar Wood offers the new Foundation Borer, an attachment that opens an entirely new source of profit to power excavator operators. A few Gar Wood features are listed below. Check your Gar Wood shovel distributor for full information.

and TRUCK CRANES

New **crane with standard 35 ft. boom . . . 75A lifts 16,500 lbs., 75B lifts 21,200 lbs. on 12 foot radius.**

GAR WOOD GW INDUSTRIES

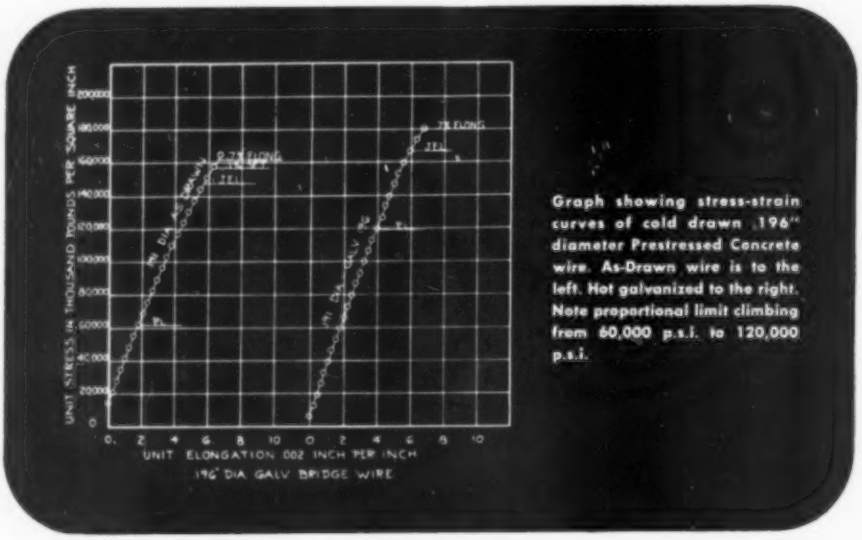
New FOUNDATION BORER

A Gar Wood Exclusive! Combines hoisting and boring for caisson holes into one operation for faster, cheaper construction of foundations.

New TRENCH HOE

¾ yd. dipper capacity with 3 other optional dippers. Digs to 17'10" depth with a cutting width of 39½".

PRESTRESSED CONCRETE



Graph showing stress-strain curves of cold drawn .196" diameter Prestressed Concrete wire. As-Drawn wire is to the left. Hot galvanized to the right. Note proportional limit climbing from 60,000 p.s.i. to 120,000 p.s.i.

Why you should use hot-dipped galvanizing

SURFACE PROTECTION is *not* the chief reason to specify hot-dipped galvanizing on your post-tensioned Prestressed Concrete projects. It's true that this method gives the best protective coating against corrosion. More important, however, hot-dip galvanizing of the acid steel relieves the wires and raises their elastic properties considerably above those of cold drawn wire.

This wire permits the use of design-tension stress of 120,000 p.s.i. Used at this value, you are always working in the elastic range of the wire itself. And we can guarantee absolute stability with no relaxation of the steel . . . your assurance of safety for the life of the structure.

Each length of Roebling Prestressed Concrete Strand is made into an assembly at the factory with the use of specially designed fittings. Each fitting develops the full breaking strength of the strand without exceeding the yield point of the material in any part of the fitting. Each assembly is then proofloaded in excess of the recommended design-tension stress.

At the construction site the use of an inexpensive hydraulic ram brings the strand assemblies to stress in minutes, cutting the on-the-job labor costs to a minimum. And you never need worry about costly take-ups either.

Strand for post-tensioning is just one of a full line of Roebling Prestressed Concrete products. Wire and strand for *pre-tensioning* are made of high tensile acid steel that results in exceptionally high elastic characteristics. They are specially treated to greatly increase their bonding quality, too.

We manufacture our own prestressing materials. We know they will deliver all we promise and more. Get the facts and figures on Roebling Prestressing materials. Write Prestressed Concrete Department, John A. Roebling's Sons Company, Trenton 2, New Jersey.

Roebling Prestressed Concrete Strand and its specially developed fitting which are available in a complete range of sizes from 5/16" to 1-9/16". With an inexpensive hydraulic ram, assemblies such as these can be brought to stress in a matter of minutes.

ROEBLING

ATLANTA, 934 AVON AVE. • BOSTON, 31 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 PRESCONIA AVE. • CLEVELAND, 701 ST. CLAIR AVE., N. E. • DENVER, 4801 JACKSON ST. • DETROIT, 815 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON, 2, N. J.

"Thor sure packs 'em in!"

One . . . two . . . THREE times the clay-packing power of the famous Thor "66T" Backfill Tamper! That's how smart contractors are "packing in" extra time and dollar savings today . . . with the great new Thor Triplex Tamper. Write for free catalog. Independent Pneumatic Tool Co., Aurora, Ill.

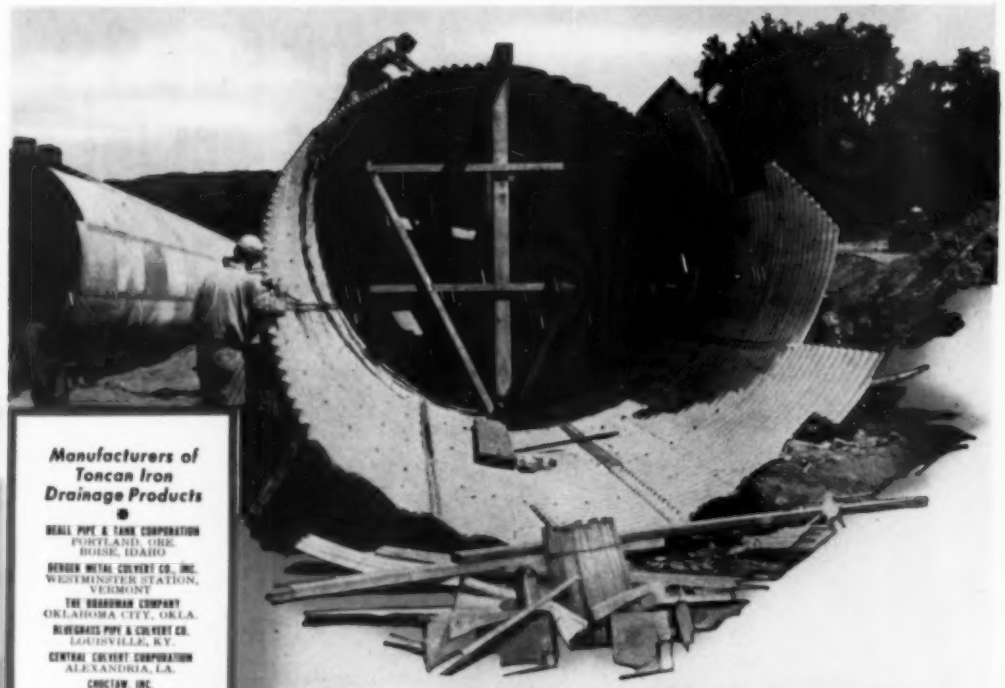
Thor TOOLS

INDEPENDENT PNEUMATIC TOOL COMPANY

PAVING BREAKERS • CLAY DIGGERS • TRENCH DIGGERS
CONCRETE VIBRATORS • ROCK DRILLS • BACKFILL TAMPERS
SUMP PUMPS • NAIL DRIVERS • SHEETING DRIVERS
CEMENT HAMMERS • ELECTRIC HAMMERS AND SAWS

BUY IT from your DISTRIBUTOR

FACTORY SERVICE BRANCHES IN 20 PRINCIPAL CITIES



Manufacturers of Toncan Iron Drainage Products

BEALL PIPE & TANK CORPORATION
PORTLAND, ORE.
BOISE, IDAHO

BERGER METAL CULVERT CO., INC.
WESTMINSTER STATION,
VERMONT

THE BOARDMAN COMPANY
OKLAHOMA CITY, OKLA.

BLUEGRASS PIPE & CULVERT CO.
LOUISVILLE, KY.

CENTRAL CULVERT CORPORATION
ALEXANDRIA, LA.

CROCTAW, INC.
MEMPHIS, TENN.

DOMINION METAL & CULVERT CORP.
ROANOKE, VA.

EATON METAL PRODUCTS CORP.
OMAHA, NEB.
HUTCHINSON, KAN.

EATON METAL PROD. CO. of MONTANA
BILLINGS, MONT.

EMPIRE STATE CULVERT CORP.
GROTON, N. Y.

ILLINOIS CULVERT & TANK CORP.
PEORIA, ILL.

JENSEN BRIDGE & SUPPLY COMPANY
SAND USKY, MICH.

THE K. V. JOHNSTON CULVERT CO.
MINNEAPOLIS, MINN.
ABERDEEN, S. DAK.

M & M RIVER MATERIALS CO.
COLUMBIA, MO.

REPUBLIC STEEL CORPORATION
Culvert Division
CANTON, OHIO
PHILADELPHIA, PA.

THOMPSON PIPE & STEEL COMPANY
DENVER, COLO.

TRI-STATE CULVERT & MFG. CO.
TAMPA, FLA.
DECATUR, GA.

UTAH CULVERT COMPANY
OGDEN, UTAH

WISCONSIN CULVERT COMPANY
MADISON, WIS.

WYATT METAL & BOILER WORKS
DALLAS, TEX.
HOUSTON, TEX.

BIG DRAINAGE JOBS *go in fast with* TONCAN IRON SECTIONAL PLATE PIPE

Big job erection like this is easy with unskilled labor when you use Toncan Iron Sectional Plate Structures. Not only are plates accurately formed and punched . . . every structure is completely pre-assembled at the mill . . . then plates and bolts are shipped "knocked down" to save freight and hauling costs.

But that's only part of the story. Once installed, Toncan Iron Drainage Structures assure long, trouble-free service. They flex with the fill—cannot crack or crumble. The *exclusive* two-inch-deep corrugations develop the highest strength among corrugated metal structures. And Toncan Iron provides the highest rust-resistance of all ferrous metals in its price class. It is an *ALLOYED IRON* . . . contains twice the copper in copper-bearing steels and irons—*plus* the proper amount of molybdenum to make the copper most effective.

See your nearest Toncan Iron Manufacturer—or write us.

REPUBLIC STEEL CORPORATION • GENERAL OFFICES: CLEVELAND 1, OHIO

Toncan Copper Molybdenum Iron Drainage Products include:
Corrugated Metal Pipe • Perforated Corrugated Metal Pipe • Sectional Plate Pipe
Sectional Plate Arches • Corrugated Metal Arch-Pipe • Sectional Plate Arch-Pipe
Corwel Subdrainage Pipe • Bituminous Coated and Paved Pipe

REFLECTO-LINER
MODEL 8

NEW, ALL-PURPOSE STRIPING MACHINE for Small Towns & Cities!

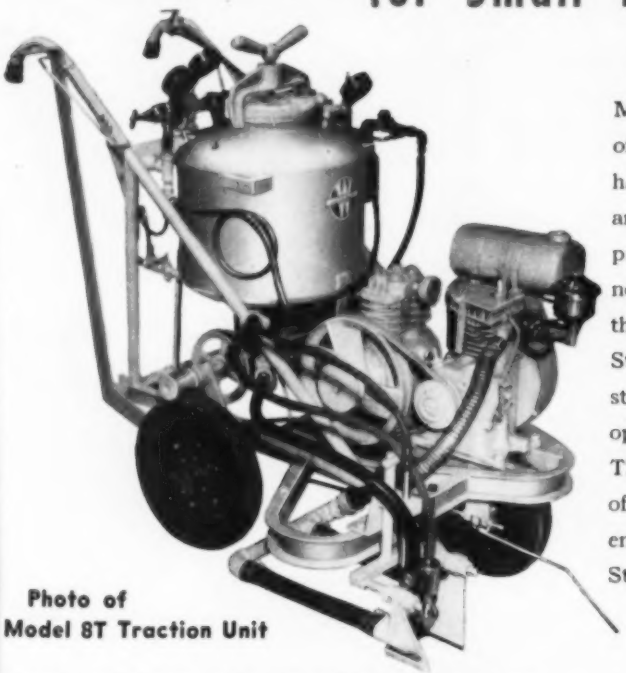
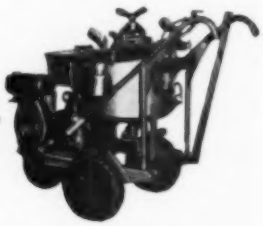


Photo of
Model 8T Traction Unit

The *New* Wald Reflecto-Liner Model 8 is the only Striping Machine of its size designed especially to handle reflective binders, compounds and plain traffic paints. Striping problems of small towns and cities now simplified through the use of the Model 8 and 8T Striper. This Striper will do jobs that the average striper cannot do . . . and can be operated manually or by traction. The Model 8 Striper embodies most of the engineering features now present in the larger Model 12 Heavy Striper.

THE RIGHT STRIPING MACHINE FOR EVERY STRIPING REQUIREMENT . . .



The Wald Reflecto-Liner Model 8T and 8 are the most up-to-date municipal traffic stripers.

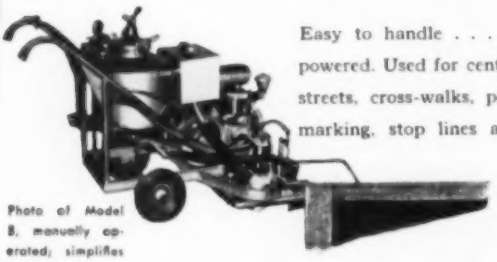


Photo of Model 8, manually operated; simplifies up-to-curb marking.

Easy to handle . . . either traction or body powered. Used for center line markings, on city streets, cross-walks, parking lanes, up-to-curb marking, stop lines and pavement markings.

For complete details, write for Bulletin #508

Wald Industries Inc.

MONTGOMERY, PA.

WIRE ROPE

This is the most economical rope we've ever made for construction equipment

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the best choice for efficiency and long life on excavating and construction equipment. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

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only Allis-Chalmers offers

HISTORY-MAKING

Tracto-Shovel Advantages

now in 3 new, BIGGER SIZES . . .

1-YD. HD-5G
2-YD. HD-9G
3-YD. HD-15G
4-YD. HD-20G

Thousands of Allis-Chalmers HD-5G 1-yd. front-end shovels are making history . . . handling an endless variety of excavating and material handling jobs faster, at lower cost than ever before.

Now . . . to meet the challenge of ever-increasing production demands, Allis-Chalmers *multiplies the scope of tractor usefulness even more.* And here's how. The same basic design — the same versatility that made the HD-5G so useful can now be yours in the 2-yd., 3-yd., and 4-yd. Tracto-Shovels. Combined with the unmatched performance of the new Allis-Chalmers tractors, they give you a real competitive advantage by bringing you a new, faster and better way of getting the job done.

A NEW ERA OF
TRACTOR USEFULNESS

Pioneering New Methods — Tracto-Shovels are blazing new trails in excavating and material handling . . . doing traditional jobs in a new, better way.

A Size for Every Job — Faster, more efficient operation at lower investment.

All-'Round Versatility — Not limited to a specific type of operation. Fourteen quickly interchangeable attachments adapt Tracto-Shovels to different assignments *in minutes*. Simple truck or trailer transportation between jobs.

Built to Take It — These new Tracto-Shovels are the toughest, strongest ever built. Every part has ample size and strength to do its job.

▲ ***World's Largest Front-End Shovel***

— handles toughest excavating and material handling jobs in a new, faster, better way. Standard bucket capacity — 4-yd.; light-materials capacity — 7-yd.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

— the newest, finest line on Earth!

"For Rough, Tough Jobs Adams Motor Graders are Tops"

—says KEELOR CONSTRUCTION CO.

• On the job pictured above, a 100 hp. Adams Motor Grader is helping to grade, widen and resurface 8 miles of road in the rock area of Pennsylvania—than which there is none rougher or tougher.

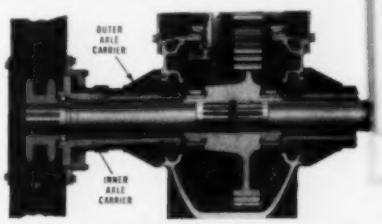
Keelor Construction Company, owner of this machine, says, "We consider Adams the best motor grader on the market, as evidenced by our recent purchase of another one of these big machines. Not only does its 100 hp. high-torque diesel engine have the lugging ability to handle roughest, toughest work, the whole machine has exceptional strength and stamina."

Performance like this is typical of all Adams Motor Graders, making them first choice of more and more contractors and highway officials. All models—from largest to smallest—offer such important advantages as *8 Overlapping Forward Speeds* • *High Arch Front Axle* • *Positive Mechanical Controls* • *Wide Range of Blade Adjustments* • and many others.

Ask your local Adams dealer to demonstrate how these great machines will step up operations and cut costs—*for you*!

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, INDIANA

ADAMS FULL-FLOATING REAR AXLE



In all Adams Motor Graders rear-end weight is borne entirely by heavy inner and outer axle carriers. The axle serves only to drive the machine—is not subject to the shocks and stresses that cause most axle failures in other graders.

Make your next motor grader an

ADAMS

Let's get down to "brass tack" facts about

CHEVROLET

Advance-Design TRUCKS

CHEVROLET first in demand in value in sales

Fact No. 1

YOU PAY LESS TO BUY!

Get the price on the Chevrolet truck that's the right size, type and capacity for your work. You'll find that it lists for less than any other truck capable of doing the same job. Chevrolet has the lowest priced line in its field.

Fact No. 2

YOU SAVE ON COST PER MILE

You can't beat Chevrolet's Valve-in-Head engine for over-all economy—fuel, oil, upkeep. It just keeps rolling along. And extra-rugged frame, hypoid rear axle, and Flexi-Mounted cab mean longer life, lower maintenance.

Fact No. 3

YOU GET THE RIGHT TRUCK FOR THE JOB

No truck is worth the price if it doesn't get the job done—fast and sure. Chevrolet trucks are *factory-matched* to the payload, *factory-matched* to the job. There's a standard body and chassis, or chassis for special body, that's just right for your work.

Fact No. 4

YOUR TRUCK INVESTMENT IS SAFER!

Comes time to trade in an old Chevrolet truck for a new one, here's good news: Year after year, used Chevrolet trucks traditionally bring more money compared to what they cost, than other makes. The demand is there, because Chevrolet trucks stand up better.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load • POWER-JET CARBURETOR—for smooth, quick acceleration response • DIAPHRAGM SPRING CLUTCH—for easy-action engagement • SYNCHRO-MESH TRANSMISSION—for fast, smooth shifting • HYPOID REAR AXLE—for dependability and long life • TORQUE-ACTION BRAKES—on light-duty models • PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES—on medium-duty models • TWIN-ACTION REAR BRAKES—on heavy-duty models • DUAL-SHOE PARKING BRAKE—for greater holding ability on heavy-duty models • CAB SEAT—with double-deck springs for complete riding comfort • VENTI-PANES—for improved cab ventilation • WIDE-BASE WHEELS—for increased tire mileage • BALL-TYPE STEERING—for easier handling • UNIT-DESIGNED BODIES—for greater load protection • ADVANCE-DESIGN STYLING—for increased comfort and modern appearance.

CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

Men and corporations in the excavating or material handling business today need the very best, most efficient tools they can get.

They need a good name behind their equipment, too, for maintenance and service are a real, inevitable part of our mechanical age.

How GOOD can a machine be? MARION, since 1884, has tried to build the best machines possible within the limits of being practical. Not the cheapest machines, but the best. Not to meet a price, but to do a job.

Any MARION representative can show you how this policy has paid dividends for owners throughout the world in terms of dependable, profitable work over long periods of time.

The thousands of MARION machines in service today and the good friends MARION has in many important industries have helped strengthen our convictions that there will always be a market for machines backed by a good company name.

Write for a copy of our new catalog, No. 403, giving condensed specifications on the complete line of MARION machines.

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MARION, OHIO, U. S. A.

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an ACCO product

The BRAND is mighty important

● This HAZARD brand on wire rope got started in 1846. It's a top brand today not because it goes back 106 years but because Hazard wire rope has kept on improving.

Hazard research and engineering has built more hours of useful work into ropes that carry this brand name. It has experimented with metals and alloys and every known lay. It is working harder than ever today improving the ropes that bear its name.

Hazard's especially proud of its LAY-SET Preformed WIRE ROPE. You can tell it by the green strand. It lasts longer and costs less to use.

makers of ACCO Registered WIRE ROPE SLINGS

ACCO

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

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In Construction work...

Here's Gas Savings up to 14%

...MORE SPEED-HAULING POWER, TOO!

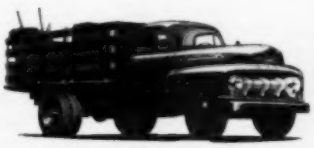
Now! Three new Ford Truck Engines feature LOW-FRICTION, high-compression, overhead valve design for more power and greater economy!

Ordinarily, friction in truck engines "wastes" power equal to about 4,200 miles for every 10,000 miles of truck travel. Now three new Ford Truck engines liberate much of this power "waste" by reducing friction up to 30%! They *deliver more* of the power they develop, save up to 1 gallon of gas in every 7!

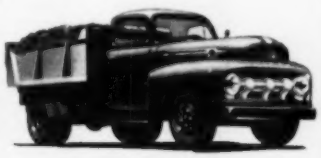
Only Ford gives you a choice of V-8 or Six in five great truck engines developing up to 155 h.p. There's the new 101-h.p. Six and two new V-8's, plus the world-famous Truck V-8—now 106 h.p., and the BIG SIX—now 112 h.p.

SERIES F-7 BIG JOB is truck leader among the "extra heavies"! It's rated for 19,000 lbs., G.V.W. New 145-h.p. CARGO KING V-8 develops more power per cu. in. than any other gasoline truck engine built by major truck producers. Short-stroke design cuts piston travel 20%. 5-speed transmission. 15-in. by 5-in., double cylinder rear brakes.

NEW 6½-FT. PICKUP offers one of the biggest bodies in the half-ton field plus low 2-ft. loading height! Choice of 101-h.p. LOW-FRICTION Six, or famous 106-h.p. Truck V-8.



FORD F-5 12-ft. (shown) or 9-ft. Stake. 14,000 lbs. G.V.W. Single- or 2-speed rear axle. Heavy duty 4-speed transmission gives easy shifting and long life. Choice of V-8 or Six engines.



FORD F-6 with special Dump body. Also available with standard 9-ft. and 12-ft. Stake and Platform bodies. Double channel frame. Choice of 106-h.p. V-8 or 112-h.p. BIG SIX.

Availability of equipment, accessories and trim as illustrated is dependent on material supply conditions.

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FORD TRUCKS for '52 cost still less to run!

FREE! MAIL THIS COUPON NOW!

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LIGHT MODELS ☐ EXTRA HEAVY-DUTY MODELS ☐

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NAME	
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Ace Construction Company	Omaha, Nebraska
Amis Construction Company	Oklahoma City, Oklahoma
Anderson & Gregory	Nashville, Tennessee
Arborio, Inc., John	Poughkeepsie, New York
Armston Company, W. H.	Dunedin, Florida
Armstrong Company, J. D.	Ames, Iowa
Arute Brothers	Meridan, Connecticut
Asphalt Paving Company	Jacksonville, Florida
Atkinson, Guy F.	San Francisco, California
Atlas Constructors	New York City, New York
Bair & Company, Roy L.	Spokane, Washington
Beard Construction Co.	Shelton, Connecticut
Best and Bartell	Cincinnati, Ohio
Bianchi and Co., Inc., C.	Framingham, Massachusetts
Blaw-Knox Construc. Company	Pine Bluff, Arkansas
Bloomer & Son, John S.	Appleton, Wisconsin
Blythe Bros. Company	Charlotte, North Carolina
Brailen Constr. Company	Griswold, Iowa
Brewster & Son, Inc., G. M.	Bogota, New Jersey
Brown Brothers	Memphis, Texas
Brown Construction Company	Pueblo, Colorado
Brown Constr. Co., G.	Glenburn, California
Brown and Root, Inc.	Houston, Texas
Broyhill & Sons, M. P.	Arlington, Virginia
Campanella & Cardi	Hillsgrove, Rhode Island
Campbell & Collins	Fargo, North Dakota
Chessher, Ben	Kingsbury, Texas
Cianchette, J. R.	Pittsfield, Maine
Clarkson Constr. Company	Kansas City, Missouri
Collins and Sons, Wm.	Fargo, North Dakota
Construction Aggregate	Newark, New Jersey
Cordell & Johnson	San Diego, California
Crawley Constr. Co., P. E.	Cambridge City, Indiana
Daufenbach, Wm.	Mankato, Minnesota
Davis Construction Corp.	Hicksville, Long Island, N. Y.
Dickinson, W. M.	So. Charleston, West Virginia
Delta Drainage & Const. Co.	Greenville, Mississippi
DeNicola Contracting Co.	Garden City Park, L. I., N. Y.
DeSalvo Construction Co.	Redwood City, California
DeShong, Leon	Plant City, Florida
Deviss Brothers	Grand Island, Nebraska
Dickerson & Winkleman Co.	Savannah, Georgia
Easley Construction Co.	Marion, Kentucky
Eckdahl, Hilding	Cumberland, Iowa
Farino Equipment Company	Jamaica, L. I., New York
Fisher Construction Co.	Cincinnati, Ohio
Fisher Contracting Co.	Phoenix, Arizona
Foley Brothers	St. Paul, Minnesota
F and S Contracting Co.	Butte, Montana
Fuller-Davies	Newport, Kentucky
Funderburk Constr. Company	Arlington, Washington
General Construction Co.	Seattle, Washington
Gibbons & Reed Const. Co.	Salt Lake City, Utah
Gilbane Building Co., Inc.	Providence, Rhode Island
Gilbert Engineering Co.	Statesville, North Carolina
Gilliland, William	Alpena, Michigan
Gillissee, John and Paul	Grand Rapids, Michigan
Good Construction Co., C. W.	Lancaster, Pennsylvania
Granite Construction Co.	Watsonville, California
Gray, Inc., Leo C.	Dewitt, New York
Green Construction Company	Oaktown, Indiana
Griffis, Wm. C.	Bagley, Minnesota
Griffith Company	Los Angeles, California
Gurthrie Constr. Company	Spokane, Washington
G and Z Contracting Co.	Memphis, Tennessee
Hable, E. W.	Corsicana, Texas
Hall, Fred	Valley Mills, Texas
Halverson Construction Co., C. M.	Portland, Oregon
Halvorsen Const. Co., H.	Spokane, Washington
Hamann, Walter	Richardton, North Dakota
Harlan Construction Co.	Republican City, Nebraska

GENERAL CONTRACTORS

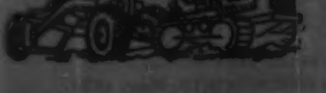
NAME	
Hawthorne, Robert	Philadelphia, Pennsylvania
Hendrickson Brothers	Valley Stream, L. I., N. Y.
Hertford Construction Co.	Hertford, North Carolina
Hicks, Harry D.	San Gabriel, California
Hite, Henderson	Bardstown, Kentucky
Highum and Wondra	Blooming Prairie, Minnesota
Hodgman and Son, W.	Fairmont, Minnesota
Holloway and Thompson	Detroit, Michigan
Hubner, C. L.	Denver, Colorado
Hulme Constr. Co., Charles	Great Bend, Kansas
Hunt Constr. Co., Arlon	East Omaha, Nebraska
Hunter Construction Co.	Ada, Oklahoma
Inter-City Sand & Gravel Co.	Eugene, Oregon
James Constr. Co., Guy	Oklahoma City, Oklahoma
Jarrell, L. L.	Whistler, Alabama
Jeffers, Inc., P. R.	Toledo, Ohio
Jurgensen, John	Newton, Ohio
Kawano and Nishida	Hilo, Territory of Hawaii
Keeley Construction Company	Clarksburg, West Virginia
Klock Construction Company	Appleton, Wisconsin
Kraus Company, Samuel	St. Louis, Missouri
Kuykendall, Crockett	Cotulla, Texas
Kuykendall, J. A.	Cotulla, Texas
Langenfelder & Son, Inc., C. J.	Baltimore, Maryland
Langey, Robert	Brenham, Texas
Latin-American Eng'g Service	San Antonio, Texas
Lee-Union Contractors	Noxon, Montana
Lively & Lindsay	Durango, Colorado
Logan & Sons, W. E.	Muskogee, Oklahoma
MacDougald Constr. Company	Atlanta, Georgia
Mackie Const. Co., Arthur	Baltimore, Maryland
Madison Constr. Company	Edwardsville, Illinois
Mahoney, J. T.	St. Louis, Missouri
Mangum, C. C.	Raleigh, North Carolina
Mauer and Otto	Sac City, Iowa
McCarthy-Pohl Constr. Co.	Nevada, Missouri
McDearmon, George	Erwinville, Louisiana
McDonald and Kruse	Los Angeles, California
McGraw Construction Company	Middletown, Ohio
McGraw & Company, F. H.	Paducah, Kentucky
McHarg, Foster	Riverside, California
McIver Construction Company	Sinton, Texas
McKee Construction Company	Jackson, Alabama
Metcalfe-Hamilton Company	New York City, New York
Miller Excavating Company	Omaha, Nebraska
Mills Construction Company	Omaha, Nebraska
Mills Company, Ralph E.	Salem, Virginia
Mitry Constructors	Los Angeles, California
Moorman & Son, J. W.	Muskogee, Oklahoma
Morrison-Knudson Const. Co.	Boise, Idaho
Morrissey, Inc., James D.	Philadelphia, Pennsylvania
Moss-Thornton Co., Inc.	Leeds, Alabama
Muehlenbeck, Wm. J.	Saginaw, Michigan
Mulligan Brothers	Greenville, Kentucky
Nelson, W. F.	San Diego, California
North Atlantic Constructors	New York City, New York
Oahu Construction Company	Honolulu, Territory of Hawaii
Oliver, Russell	Colburn, Idaho
Olson & Sons, G. A.	Marshall, Minnesota
Osburn & Co., Inc. H. T.	Franklin, Pennsylvania
Patterson Construction Co.	Monongahela, Pennsylvania
Perry Construction Company	Scranton, Pennsylvania
Petrillo, Inc., Edward	Yonkers, New York
Pioneer Constructors	Tuscon, Arizona
Pohl Constr. Co., Jos. L.	St. Louis, Missouri
Pool Construction Company	Shawnee, Oklahoma
Porter-DeWitt Constr. Co.	Poplar Bluff, Missouri
Price, Osborne, Osborne, & Mahon	Lynchburg, Tennessee
Pullen and Owens	Nashville, Tennessee
Rankin and Williams	Pearsall, Texas
Rapone Contracting Company	Hicksville, L. I., New York
Rayn & Sons, P. W.	Janesville, Wisconsin

GENERAL CONTRACTORS

NAME	
Rexroth & Rexroth	Bakersfield, California
Rider, Orval	Yuma, Arizona
Ruby Construction Company	Madisonville, Kentucky
Ruth Construction Company	Scottdale, Pennsylvania
Rutherford Corporation	Oakland, California
Ryan Construction Company	Evansville, Indiana
Salvucci, Peter	Waltham, Massachusetts
Sarafini Constr. Co., Inc.	Binghamton, New York
Savin Constr. Co., A. I.	East Hartford, Connecticut
Scheel, Ralph D.	Del Norte, Colorado
Schlessinger and Patterson	Chandler, Arizona
Schutz Contracting Co., John	Garden City Park, L. I., N. Y.
Scott, Inc., W. H.	Franklin, Virginia
Sharrock & Pursel	Casper, Wyoming
Silver State Constr. Co.	Fallon, Nevada
S & M Construction Co., Inc.	Providence, Rhode Island
Smalley, D. R.	Sabina, Ohio
Smith Construction Company	Pelham, New York
Smith, Odle, and Smith	Muskogee, Oklahoma
Snare Corporation, Frederick	New York City, New York
Soto Constr. Company, Jos.	San Jose, California
Steers-Grove	New York City, New York
Steinkamp, Inc., E.	Los Angeles, California
Stewart, Howard	Brookville, Indiana
Stone City Constr. Company	Bedford, Indiana
Stovall, R. B.	Dallas, Texas
Stuart, J. O. and C. M.	Washington, D. C.
Sueltenfuss, James	Blanco, Texas
Tangmo Construction Company	Missoula, Montana
Teer Company, Nello L.	Durham, North Carolina
Teichert & Son, Inc.	Sacramento, California
Tanaka, J. M.	Hilo, Territory of Hawaii
Texas Construction Company	Dallas, Texas
Thompson, C. G.	Paris, Texas
Thornburg, Vance	Payonia, Colorado
Tomlinson, T. R.	Doyline, Louisiana
Torrington Construction Co.	Oneonta, New York
Tower Contracting Co., Doug	Homestead, Florida
Trisdale, Inc., J. H.	Martin City, Montana
Turpin & Stewart	Cincinnati, Ohio
Vecellio and Grogan	Beckley, West Virginia
Vinnell United Bell Company	Trenton, Nebraska
Wartes, Lacy	Lubbock, Texas
[illegible], John	Auburn, Iowa
Wester Construction Co.	Buggs Island, North Carolina
White Oak Excavators	Plainville, Connecticut
Winkelman Co., Inc., D. W.	Syracuse, New York
Wright Contracting Company	Columbus, Georgia
Wright, John D.	Talco, Texas
Wyner & Company, Inc., Gil	Malden, Massachusetts
Zara Contracting Company	Hewlett, L. I., New York

MINING

NAME	
Allen Brothers	Oliver Springs, Tennessee
A & H Coal Co.	Shinnston, West Virginia
A. & P. Mining Co.	Enterprise, West Virginia
Bitner Fuel Co.	Jane Lew, West Virginia
Blair & Oldham Construction Co.	Pound, Virginia
B & M Coal Co.	Woodville, Pennsylvania
Bolling Construction Co.	Pound, Virginia
Bertz & Bertz Coal Co.	Stoneboro, Pennsylvania
Bowling, Tyler	Bluefield, West Virginia
Brown, Earl M.	Clearfield, Pennsylvania
Calvert & Youngblood	Trafford, Alabama
Casella Coal Co.	Buckhannon, West Virginia
Cleghorn, L. E.	Clarksburg, West Virginia
Cleveland Cliffs Mining	Nashwauk, Minnesota
Coal Strippers, Inc.	Weston, West Virginia
Compass Coal Co.	Philippi, West Virginia
Consolidated Coal Co.	Jenkins, Kentucky



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MINING

NAME	
Coronet Phosphate Co.	Plant City, Florida
C. & P. Coal Co.	Fairmont, West Virginia
Daugherty Coal Co.	Terra Alta, West Virginia
Deanville Coal Co.	Weston, West Virginia
Drummond Coal Co., H. E.	Jasper, Alabama
Ford & Gaskill	Greensboro, Pennsylvania
Galloway Coal Mining Co.	Carbon Hill, Alabama
Georgia Kaolin Co.	Atlanta, Georgia
Greasy Ridge Coal Co.	Ironton, Ohio
Hanna Coal Co.	Adena, Ohio
Manna Co., M. A.	Hibbing, Minnesota
Hazelwood, George F.	Cumberland, Maryland
Imperial Coal and Construction Co.	Rupert, West Virginia
Kelly Coal Co.	Beelick Knob, West Virginia
Liles and Son, H. B.	Winona, West Virginia
Mays Coal Co.	Clarion, Pennsylvania
McCarrell & Grimes	Sanders, Arizona
McComas Berkley	Scottown, Ohio
Michigan Limestone & Chemical Co.	Rogers City, Michigan
Mottern, Harry	Liberty, Pennsylvania
Nashville Coal Co.	Nashville, Tennessee
New Shawmut Mining Co.	Wendsville, Pennsylvania
Ohio River Collieries	Columbus, Ohio
Oliver Iron Mining Co.	Coleraine, Hibbing & Va., Minn.
Pendergrass, Zeb	Bainelle, West Virginia
Phelps Dodge Corp.	Douglas, Arizona
Pickands Mather Co.	Hibbing, Minnesota
Putman & Greene	Osceola Mills, Pennsylvania
Quinn, Ted	Sterling Run, Pennsylvania
Rardin Bros.	Akron, Ohio
R. & V. Contracting Co.	Clarksburg, West Virginia
Sanbrac Coal Co.	Pittsburgh, Pennsylvania
S. B. & S. Co.	Pottsville, Pennsylvania
Scott Coal Co.	Clarksburg, West Virginia
Shatzer, Robert	Philippi, West Virginia
Sherman, Joe	Hawthorn, Pennsylvania
Snyder Brothers	Cowansville, Pennsylvania
Stripping Contractors	Clearfield, Pennsylvania
Trentino Bros., Inc.	Mt. Hope, West Virginia
Truax Traer Coal Co.	Pinckneyville, Illinois
Usibelli Coal Mines	Healy River, Alaska
Wabash Ridge Corp.	Rossiter, Pennsylvania
Watts & Sons Coal Co., Charles	Oliver Springs, Tennessee
Whitaker Coal Co., H. B.	Norton, Virginia
Yates Coal Co.	Ashland, Kentucky

LOGGING

NAME	
Abaco Lumber Co.	Nassau County, Bahamas
Anderson, Mel	Weaverville, California
Arch Cape Logging Co.	Tillamook, Oregon
Arrow Mills	Eureka, California
Bohemia Lumber Co.	Cottage Grove, Oregon
Brown and Berti Timber Co.	Bodega Bay, California
Brown Tie and Lumber Co.	McCall, Idaho
Buck Mountain Logging Co.	Shelton, Washington
Cal-Ida Lumber Co.	Downieville, California
Cawrse Lumber Co.	Myrtle Point, Oregon

LOGGING

NAME	
Clackamas Logging Co.	Portland, Oregon
Coastal Plywood Co.	Cloverdale, California
Denny Logging Co.	Willamina, Oregon
DeVilbiss, C. Dudley	Ukiah, California
Fisch Logging Co.	Arcata, California
Flodin Lumber Co.	Thompson Falls, Montana
Ford, Donald A.	Ukiah, California
Fresch Oil Co.	Bonners Ferry, Idaho
Gooch Logging Co.	Lyons, Oregon
Hammond Lumber Co.	Trinidad, California
Hines Lumber Co.	Westfir, Oregon
Ladew Timber Co.	Orick, California
Long Bell Lumber Co.	Vaughn, Oregon
Marevakon Logging Co.	Renton, Washington
Matheney, S. P.	Sublimity, Oregon
McCallie Logging Co., B. L.	Eugene, Oregon
McCallie Bros. Logging Co.	Lebanon, Oregon
McNutt Bros. Construction Co.	Eugene, Oregon
Michigan-California Lumber Co.	Camino, Calif.
Mortensen, Inc., Lee	Roseburg, Oregon
Neils Lumber Co., J.	Libby, Montana
N.S.P. Logging Co.	Coquille, Oregon
Opperman, Ralph	Qualala, California
Paul Bunyan Lumber Co.	Susanville, California
Portland Creek Logging Co.	Oakland, Oregon
Potlatch Forests, Inc.	Lewiston, Idaho
Rasor Logging Co.	Eugene, Oregon
Rayonier, Inc.	Sapho, Washington
Russell & Sons, V. R.	Valsetz, Oregon
Russell & Gillette	Cle Elum, Washington
Schuler Construction Co., I. F.	Robbinsville, North Carolina
Siuslaw Forest Products Co.	Mapleton, Oregon
Smith Lumber Co., Ralph L.	Anderson, California
Smith, Ralph	Tillamook, Oregon
Snoqualmie Falls Lumber Co.	Snoqualmie Falls, Washington
Stoddard, Roy	Fort Bragg, California
Sweet Brothers Lumber Co.	Eugene, Oregon
Ulrich, Hiram	Spokane, Washington
Union Lumber Co.	Fort Bragg, California
Vosbury & White	Alsea, Oregon
Westside Lumber Co.	Tuolumne, California
Wyerhauesr Timber Co.	Tacoma, Washington
White River Lumber Co.	Enumclaw, Washington
Willamette Valley Lumber Co.	Dallas, Oregon
Wooley, Harold	Dixon, Oregon

PIPELINE

NAME	
Anderson Brothers	Houston, Texas
Anderson Construction Co.	Salem, Illinois
Associated Pipe Line Corp.	Houston, Texas
Bechtel Corp.	San Francisco, California
Bishop and Luck	Dallas, Texas
Britton Contracting Co.	Washington, Pennsylvania
Burdon Construction Co., O. R.	Wichita Falls, Texas

PIPELINE

NAME	
Fulton, R. H.	Lubbock, Texas
El Paso Natural Gas Co.	El Paso, Texas
Gentry Construction Co., H. L.	Jackson, Mich.
Mahoney Contracting Co.	Lansing, Michigan
Midwestern Constructors	Tulsa, Oklahoma
Morrison Construction Co.	Austin, Texas
Oklahoma Construction Co.	Dallas, Texas
Price Company, H. C.	Bartlesville, Okla.
Saugh Company, N. A.	Campbellsville, Kentucky
Smith Contracting Co.	Ft. Worth, Texas
Smith Contractor Corp.	Altavista, Virginia
Texas-Louisiana M. K.	Ft. Worth, Texas

MISCELLANEOUS

NAME	
Alaska Road Commission	Alaska
Baltimore, City of	Baltimore, Maryland
Bethlehem Steel Co.	Bethlehem & Steelton, Pa.
Commonwealth Edison Co.	Chicago, Illinois
Consumers Power Co.	Jackson, Michigan
Dane County Highway Dept.	Madison, Wisconsin
DuPont, E. I. deNemours & Co., Inc.	Wilmington, Delaware
Duquesne Light Co.	Pittsburgh, Pennsylvania
Kekaha Sugar Co., Ltd.	Kekaha, Kauai, T. H.
Lone Star Steel Co.	Lone Star, Texas
Niagara Mohawk Power Corp.	Albany, New York
Northern Indiana Public Service Co.	Gary, Indiana
Public Service Co., No. Illinois	Chicago, Illinois
Sheboygan County Highway Dept.	Sheboygan, Wisconsin
Tennessee Coal and Iron Co.	Fairfield, Alabama
Tennessee Valley Authority	Knoxville & Chattanooga, Tennessee
U. S. Atomic Energy Commission	Oak Ridge, Tennessee
U. S. Engineers	Tulsa, Oklahoma
W. Virginia State Road Commission	Charleston, West Virginia

CANADIAN CONTRACTORS

NAME	
Iron Ore Company of Canada, Ltd.	Montreal
Bell Asbestos Corp.	Asbestos, Quebec
Fraser Brace Ltd.	Montreal
Shawinigan Power, Ltd.	Montreal
McFarland Construction Co., Ltd.	Picton, Ontario
Ontario Hydro Electric Commission	Toronto
Peel Construction Ltd.	Brampton, Ontario
Carter Construction Ltd.	Toronto, Ontario
Wesson Coal Stripping	Minto, N. B.
Sten Peterson	Winnipeg, Manitoba
Bird Construction Ltd.	Regina, Saskatchewan
Morrison-Knudson (Canada) Ltd.	Vancouver, B. C.
Alaska Pine Ltd.	Vancouver, B. C.
Steegrack Iron Mines Ltd.	Steegrack, Ontario
Aluminum Co. of Canada	Montreal, Quebec
Colonese Corp. Ltd., of Canada	

The list of TD-24 fleet owners is growing every day, as is the vastly longer list of owners of single TD-24 tractors. For this reason the above list is not complete. If you're a TD-24 fleet owner whose name is missing, we'll catch you next time.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

Some of the Jobs HUBER MAINTAINERS Are Doing

NATIONAL GOVERNMENTS

Grading and maintenance work on highways and secondary roads in national parks, reservations, national public lands.

STATES

Highway grading and maintenance service of many kinds including berm grading, mowing, ditch cleaning, etc.

COUNTIES

Highway and secondary road grading and maintenance work. Counties owning attachments keep HUBERS busy every month of the year.

MUNICIPALITIES

Street and alley grading and maintenance; every type of maintainer attachment is in municipal service.

TOWNSHIPS

Townships charged with road maintenance are among favorite users of Huber Maintainers for grader and maintenance work.

PUBLIC GROUNDS

Parks, playgrounds, conservation areas, publicly-owned beach areas need and use HUBERS for grader and maintenance service.

OIL FIELDS

HUBERS are at work in the oil fields, grading and maintaining off-the-highway roads and building dams around oil wells and storage tanks.

CEMETERIES

Cemeteries keep HUBERS busy every month, grading and maintaining drives, mowing, developing new grounds, removing snow, patching pavements, etc.

AIRPORTS

HUBERS are tailor-made for airport service, grading unpaved areas, patching paved areas, mowing, removing snow, towing planes, etc.

LOGGING

Grading and maintaining logging camp roads, mowing, bulldozer service.

INDUSTRIES

Many industrial users include factories with sizeable grounds and miles of roadways; lift loader widely used for cleanup work around factory sites.

MINES

Grading and maintenance of roadways; broom widely used around strip mines to sweep coal veins before removal.

ESTATES & RANCHES

Grading and maintenance of roadways; lift loader for cleanup; mower widely used.

RACE TRACKS

Grading and maintenance of track and of surrounding roadways and grounds.

CONTRACTORS

Contractors, large and small, in all kinds of contract work, are enthusiastic HUBER users. They like versatility of HUBERS, ability to move rapidly from one job to another.

HUBER MANUFACTURING CO. • Marion, Ohio, U. S. A.

Manufacturers of Huber Maintainers, Graders and Complete Line of Rollers

HUBER

If it's a "QUICK-WAY," it's a MONEY MAKER

The World's Leading Truck Shovel

"QUICK-WAY"

"QUICK-WAY" Model J Dragline

"QUICK-WAY" Model S Shovel

"QUICK-WAY" Model E Trench Hoe

"QUICK-WAY," the original truck shovel and always the standard, has for 30 years demonstrated its versatility and adaptability, as well as its superb engineering and long lasting construction — not only in the United States but in 65 foreign countries as well.

"QUICK-WAYS" get to and from the job faster — up to 50 miles an hour on the highway. They're quickly convertible in minutes — an attachment for every job, with four booms, shovel, scoop, trench hoe and crane. As a dragline, clamshell, pile driver, log grapple, magnet, silage or hay fork, "QUICK-WAY" is a fast moneymaker. Crane hook, concrete bucket and other special purpose tools are available.

In "QUICK-WAY" you get fine construction, all steel for strength and lightness, accurate balance. High capacity to weight ratio. Quality construction means longer life — more profits on a small investment. Economical to buy. Write today.

You can mount basic unit on your own truck or purchase complete with your choice of trucks.

Model L 10 Ton Crane, ½ Yd. Shovel, 7½ to 10 Ton Truck
Model E 7½ Ton Crane, 4/10 Yd. Shovel, 5 to 7½ Ton Truck
Model S 5 Ton Crane, ½ Yd. Shovel, 2 to 3½ Ton Truck
Model J 3 Ton Crane, ¼ Yd. Shovel, 1½ to 2½ Ton Truck

Mail Coupon Today!

"QUICK-WAY" TRUCK SHOVEL CO.
Dept 64 • 2401 East 40th Ave.
Denver, Colorado • U.S.A.

Please send me complete details on "QUICK-WAY" truck shovels — four different models for large jobs and small.

Name _____

Address _____

City _____ *State* _____

MARION BODIES AND HOISTS

use MARION Bodies and Hoists for More work . . . at Less cost!

The workload capacity of any dump body is directly proportional to the efficiency of the hoist. That's why Marion Hoists turn out *more* work at *less* cost.

You see—Marion Hoists operate at a *low* uniform oil-pressure throughout the dumping cycle . . . regardless of load or dumping conditions. This means less wear and tear on vital parts and a smoother, *more* dependable dumping operation.

Consequently, Marion owners get more work . . . yet enjoy trouble-free operation, thus cutting maintenance and down time to a minimum.

This is just part of the story, your nearby Marion Distributor can give you *all* the facts and figures . . . or write direct. There's no obligation, of course.

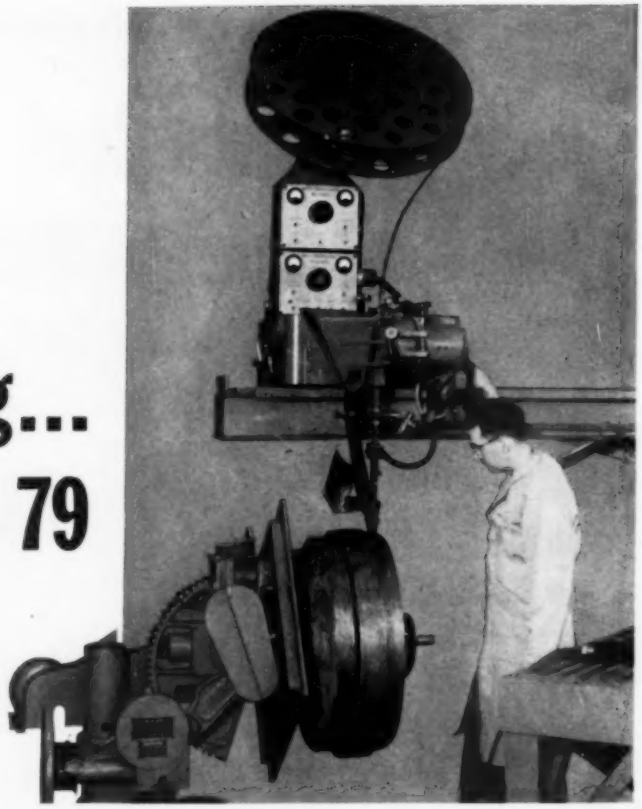
"Designed on the Job"

MARION BODIES AND HOISTS

METAL PRODUCTS CO.
Marion, Ohio, U. S. A.

Manufacturing a complete line of standard and special Hydraulic Hoists and Dump Bodies

Announcing... Amsco AW 79



for AUTOMATIC HARDFACING

AMSCO AW 79 will meet your every requirement for better control of wear where abrasion and high impact are important factors—plus giving you all the advantages of automatic welding. It can be used for reclaiming parts worn to uselessness or for increasing productivity of new parts.

The result of extensive research and field testing, AMSCO AW 79 is especially suitable for rebuilding and hardfacing tractor rollers and idlers. Back-up rolls, steel wheels, sheeting rolls, dredge pins, as well as dozens of other applications, can be successfully hardfaced with AW 79. It can be used on any conventional automatic submerged arc welding equipment now being used.

AW 79, the first in a series of rods by AMSCO for automatic hardfacing, is an alloy steel electrode fabricated by encasing particles of alloy metals in a continuous steel tube. Deposits are of martensitic alloy steel with chromium and molybdenum as the principal alloying agents. It is available in coils weighing approximately 100 lbs., each with an inside coil diameter of 22½", and is stocked in wire diameters of 5/32" and 3/16". Packed in cardboard containers with an anti-rust agent, other coil diameters and sizes are available on request. Write today for complete information.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

406 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

Flood control levee gets a lift from "Caterpillar" power

BUILDING a 13-mile section of flood control levee in the Florida Everglades, Hooper Construction Company of Coral Gables relies heavily on "Caterpillar" equipment. A D17000 Engine powers the Link-Belt Speeder 2½-yard Dragline. A D8 Tractor with No. 8S 'Dozer works with the dragline. And two D13000 Engines with two Gardner-Denver 500-foot compressors on tracks, pulled by a D6 Tractor, provide the blast hole power for shooting coral rock. In all, Hooper's "Caterpillar" lineup includes 12 tractors, 5 motor graders and several engines.

On this project, holes are drilled 14 feet deep and shot 72 at a time, each shot loosening about 30 cu. yds. of coral. 260,000 cu. yds. are excavated a month. The resulting canal is 75 feet wide and 14 feet deep.

Like Hooper, many other contractors have found that it pays to standardize on "Caterpillar" units. They are engineered for steady performance with a minimum of down-time. As sturdy as they are, they'll do even *more* work at *lower* cost if given good care. You don't have to coddle them — proper maintenance takes only a few minutes a day. And remember, your nearby "Caterpillar" Dealer has the facilities for specialized service — any time you need it, call on him!

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

HERE'S HOW Armstrong & Armstrong desert dirtmoving conditions in

"Desert-moving" — that's what you might call Armstrong & Armstrong's 850,000-yd. relocation of U. S. 70-80 between Lordsburg and Deming, New Mexico. At the time pictures were taken, no rain had fallen on the entire 27-mile stretch for 11 months . . . the sandy loam soil was so dry that it powdered around your feet and billowed before a scraper blade like a sand storm. Dust stood 6" deep in the cuts. Material was exceptionally difficult to load and very abrasive. Yet, the Roswell contractors moved the dirt with their 2 C Tournapulls at a record rate. Here's the kind of output these 2 rubber-tired rigs were getting, 9 hours a day, 5 days a week, to help keep production on schedule:

Tournapull averages 15 m.p.h. for the 6000' cycle, despite altitudes of over 4000' near the Continental divide. Rig drove 100 miles through traffic to job from El Paso.

Tournapull spreads heaped load on the run in 13 seconds, holding accurate grade. Said one operator, "This is the sweetest running dirtmover I've ever worked with."

Tournapull—Trademark Reg. U. S. Pat. Off.

are licking New Mexico

Tournapull is push-loaded by 175 h.p. tractor with 10 to 11 pay yards of "dead" sandy loam in an average of 75 feet.

Here, Tournapulls are bringing in cover for reinforced concrete drain tile. Project includes laying 27,000 lineal feet of 24-inch to 48-inch diameter tile.

190 pay yards hourly

Push-loaded by a 175 h.p. tractor, each Tournapull heaped 10 to 11 pay yards in 75'. 3000' haul was made at 10 m.p.h. . . . spread took 200' . . . return of 3000' to cut was made at 20 m.p.h. Cycle time averaged about 5¼ minutes, for a unit production of about 95 pay yards (9 loads) per 50-minute hour. Says Superintendent Ben Kelly, Jr., "We are very satisfied with the C Tournapulls — especially with their method of excavating backslopes."

Let Tournapull's outstanding earthmoving ability save time and money for you on *your* work, too. Ask your LeTourneau Distributor to demonstrate the many advantages of having rubber tires rolling *over* abrasives . . . rather than tracks grinding *in* abrasives. See for yourself why Tournapulls will move more yards-per-hour on your job.

R. G. LeTOURNEAU, INC.

Peoria, Illinois

LETOURNEAU LET EQUIPMENT

for REACH *and* SPEED —the paver for any pouring job

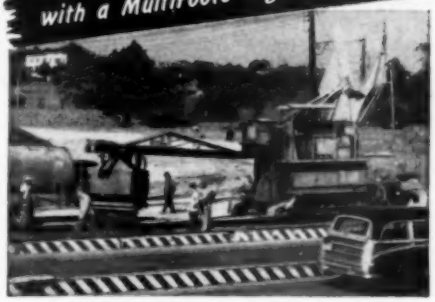
LOOK at the picture above—one machine that can place itself in any location—no expense for purchase or operation of a hoisting mechanism—no extra cost for truck equipment—minimum operating crew! Here is pouring at low cost.

MultiFoote brings you the greatest combination for mixing and pouring concrete you can find anywhere. One unit with the MultiFoote HighLift Boom permits you to mix and pour three stories up and then by simply lowering the boom or with a simple change in booms where extra long HighLift Booms have been used, you are equipped for pouring slab at a speed that has seldom been equalled.

MultiFoote Pavers have established records for pouring slab at the rate of a mile a day. With the MultiFoote you are ready to bid on a wide range of contracts and three sizes of MultiFoote Pavers from a 27-E Single Drum to the big 34-E DuoMix care for practically any capacity problem. Ask for details.

THE FOOTE COMPANY, INC.
Subsidiary of Blaw-Knox Co.
1936 State Street Nunda, New York

FREE YOUR CRANE for other Work with a MultiFoote HighLift Boom



MultiFoote 34-E DuoMix getting out 50 batches an hour even with difficult traffic conditions impeding trucks.

MULTIFOOTE PAVER

FOR EVERY PLACE CONCRETE MUST BE POURED

A BLAW-KNOX PRODUCT

Eaton 2-Speeds are designed and built for simple, low cost maintenance

Eaton 2-Speeds will take years of heavy-duty operation. Eaton's exclusive planetary gearing better distributes gear-tooth loads, and the exclusive forced-feed oiling system provides positive lubrication even at slowest vehicle speeds. Extra rugged construction eliminates the possibility of distortion or misalignment under heaviest loads. When repair *is* necessary, practical down-to-earth design makes the work quick, easy, and economical. Eaton 2-Speeds also reduce maintenance cost on the vehicle through lower stress and less wear on engines and power transmitting parts. Ask your dealer to explain how Eaton 2-Speeds will help *your* trucks haul more, faster, longer, at less cost.

EATON

2-Speed Truck

AXLES

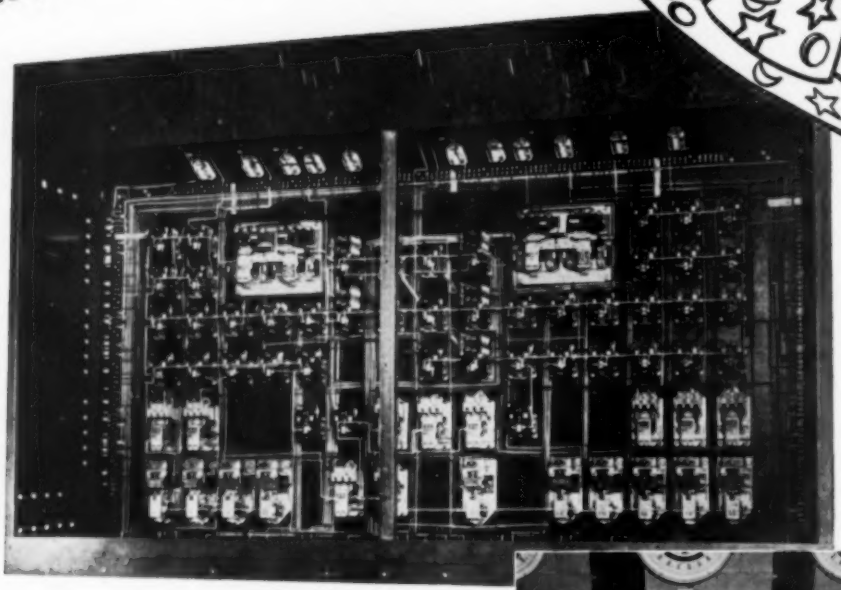
Axle Division

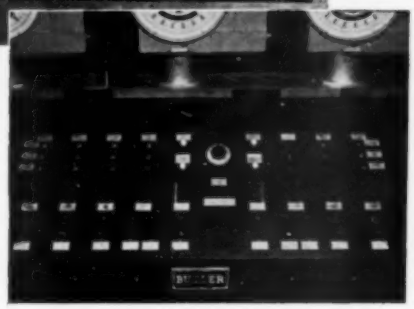
EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

The Electrical WIZARD of WAUKESHA





How completely automatic and fool-proof can a Central Mixing Plant get?

BUTLER has the answer in the control system built for the BUTLER Central Mixing Plant destined to pour concrete for the gigantic H-Bomb Plant.

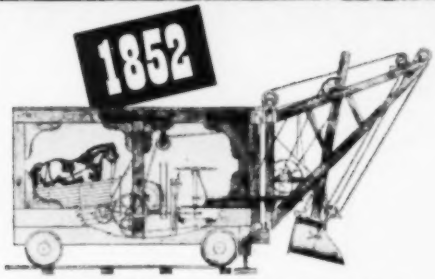
Complex? Yes — vastly. Just glance at the wiring. But it's fool-proof and positive in its operational sequence as the sun. So completely interlocked that it rejects human mistakes, this BUTLER wizard batches 7 materials including water with split-pound accuracy in record breaking time.

Need for such equipment does not arise every day. But the point is this: that BUTLER Engineers can conquer a problem of such complexity is sound evidence of exceptional experience and ability. And that pays off in an exceptional profit for you.

So whether it's a Central or a Ready Mix Plant, a Roadbuilders or a Concrete Products Plant you have in mind — consult the BUTLER ENGINEER.

BUTLER
BIN COMPANY
959 Blackstone Ave.
Waukesha, Wis.

100 years of progress in OSGOOD shovels



OSGOOD'S 2-horse power excavator

of 100 years ago was powered by a team of horses on a treadmill inside the machine. Although crude by today's standards, this excavator embodied the four principal functions of a modern power shovel; (1) Crowd (2) Hoist (3) Swing (4) Travel. Then, as now, the name OSGOOD stood for sound engineering.

Progress in excavating equipment has been rapid during the past 100 years, but one thing has not changed. Now, as in 1852, the most efficient, most advanced earth-moving equipment is built by OSGOOD — oldest name in the power shovel and crane industry.

Through the years, OSGOOD has been noted for its unparalleled engineering leadership, and today's OSGOOD machines are unequalled in ability to increase your profits.

You owe it to your future to investigate the many modern OSGOOD features designed to increase work capacity, reduce maintenance, and cut down-time. Find out why OSGOOD shovels are setting new production records on jobs from coast to coast. Write today.

MEMBER PCSA

EQUIPMENT DESIGNED WITH YOUR PROFIT IN MIND

9814

The OSGOOD COMPANY

MARION, OHIO

AFFILIATED WITH THE GENERAL EXCAVATOR CO.

POWER SHOVELS, CRANES, DRAGLINES, CLAMSHELLS, PILE DRIVERS & HOES. CRAWLER, TRUCK OR WHEEL MOUNTED. DIESEL, GASOLINE OR ELECTRIC POWERED. CAPACITIES ½ TO 2½ CU. YD.

widely used,
widely endorsed

ayr trap

THE AIR-ENTRAINING AGENT FOR CONCRETE

a large ready-mix plant: "Having used Ayr-Trap for the past four years with very satisfactory results places us in a position to recommend it to all ready-mix concerns."

a concrete block company: "We heartily recommend Ayr-Trap. The quality of the block is much improved and the appearance much better. The whole operation in making the blocks is easier."

a general contractor: "Horn Ayr-Trap is very beneficial to our construction due to the type of aggregate we use. The Ayr-Trap controls the set of the mortar by functioning as a dispersing agent."

a mining company: "We are firmly convinced that the use of Ayr-Trap makes a much more workable concrete, that stripped work has a much better appearance with a much greater resistance to damage from freezing."

Used in the newest State Turnpike circle and bridge construction

for heavy concrete construction
Ayr-Trap can be added at batching plants or on the job. It makes concrete more durable, increases its plasticity and minimizes segregation and bleeding. Increased plasticity with Ayr-Trap insures better placement of concrete in and around closely spaced reinforcing bars. Ayr-Trap develops high resistance to moisture absorption and attack from freezing and thawing forces.

road building
Ayr-Trap improves scaling resistance and protects pavements against the destructive action of chloride salts for ice, snow removal.

OTHER BENEFICIAL PROPERTIES
- Permits a reduction in the water cement ratio.
- Used in liquid form as follows:
  3 liquid ounces per cubic yard of 5 or 6 bag mix.
  1 pint for 5 cubic yards. 6 bag mix.

HORN

A. C. HORN COMPANY, Inc. est. 1897

Manufacturers of materials for building maintenance and construction
LONG ISLAND CITY 1, N. Y. • Los Angeles • San Francisco • Houston
Chicago • Toronto SUBSIDIARY OF SUN CHEMICAL CORP.

RS-2

A. C. HORN COMPANY, INC.,
Long Island City 1, N. Y.
Please send me ☐ complete data on AYR-TRAP

HORN ☐ free copy of your 96-page Construction Data Handbook

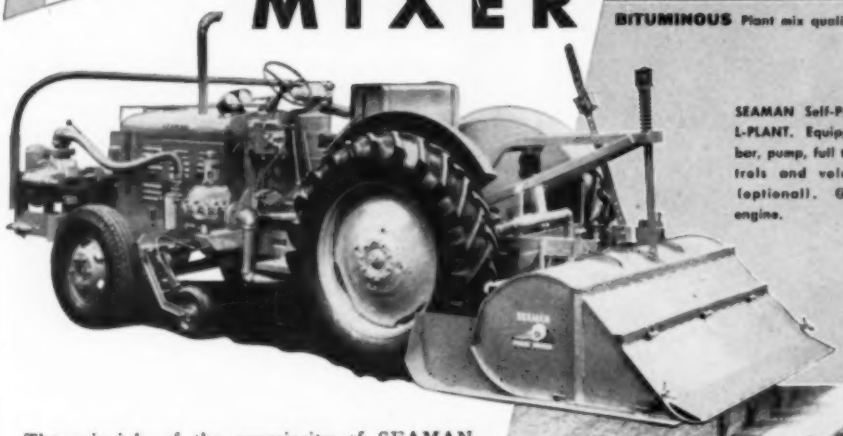
NAME_____ TITLE_____

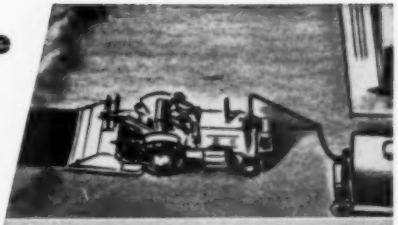
FIRM NAME_____

ADDRESS_____

CITY_____ STATE_____

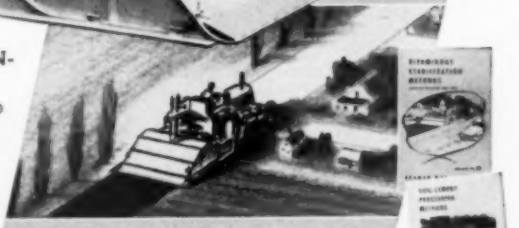
whatever move you make you're a winner with the SEAMAN MIXER



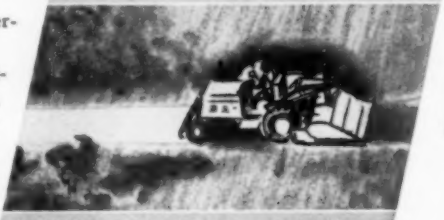


BITUMINOUS Plant mix quality at road mix cost.

SEAMAN Self-Propelled TRAV-L-PLANT. Equipped with spray bar, pump, full tachometer controls and volumetric meter (optional). Gas or diesel engine.



MACADAM Perfect keying and interlocking of stone and distribution of fines with the SEAMAN.



GRAVEL SEAMAN-stabilization saves $150.00 to $500.00 per mile each year in maintenance and new gravel.

SOIL-CEMENT 15% stronger soil-cement bases with SEAMAN-mixing.

The principle of the superiority of SEAMAN-mixing is in the blending of all materials so uniformly that the strongest, highest load-bearing, wear and weather-resistant base is produced. Add to this the high daily output of mixed materials, the remarkably low operating cost and the small purchase investment required — and you will see why the SEAMAN is building *more miles of better roads for the tax-dollar* — than is possible with any other method of mixing. So it's your move. Make it a winner — with the SEAMAN MIXER

FREE! Comprehensive, detailed Bulletins on

- ☐ Bituminous Construction (No. 40)
- ☐ Soil Cement Construction (No. 50)
- ☐ Macadam Base Construction (No. 60)
- ☐ Gravel Stabilization (No. 65)

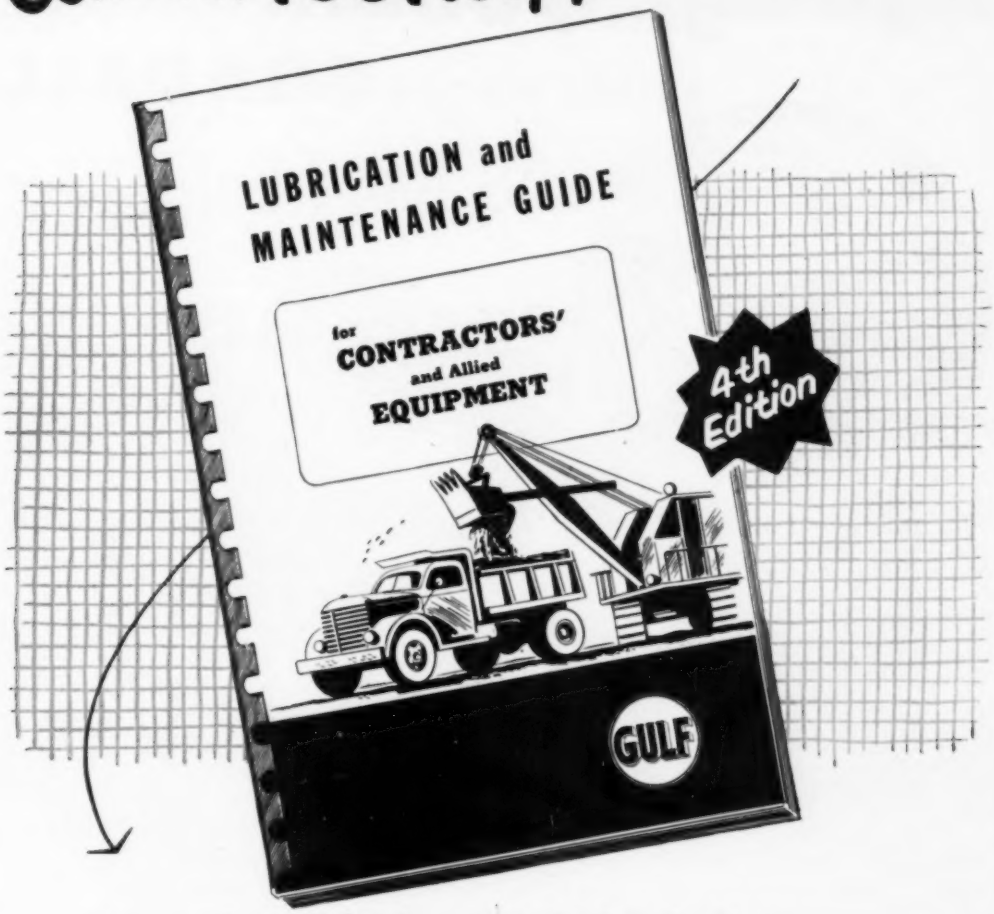
Check those you want— or write giving the Bulletin numbers. Do it today.

SEAMAN MOTORS, INC.

291 N. 25th St.

MILWAUKEE 3, WISCONSIN

Send for YOUR copy of this valuable book



96 pages of up-to-date information in handy pocket size!

JUST OFF THE PRESS, the new revised edition of this popular Guide is chock-full of the latest facts on how to properly lubricate and maintain your equipment.

As its title implies, this informative book suggests the proper lubrication and maintenance of contractors' equipment. In addition, it covers similiar types used by quarries, crushed stone plants, sand and gravel, and other operations.

It has been especially prepared by Gulf Lubrication Engineers with the sincere hope that it will prove helpful to you and your organization. It is easy to read and authentic in every detail. For your copy of this useful book, mail the attached coupon.

GULF

Gulf Oil Corporation · Gulf Refining Company

719 Gulf Building, Pittsburgh 30, Pa. R&S

Please send me, without obligation, my free copy of the new revised edition of "Lubrication and Maintenance Guide for Contractors' and Allied Equipment."

Name .....

Company .....

Title .....

Address .....

Tough Jobs...

A CINCH FOR THE GRADALL

THE multi-purpose Gradall handles the *complete* job of pavement removal. To remove asphalt pavement, the Gradall exerts its powerful hydraulic "down pressure" to rip up the pavement in large pieces. Then it loads them onto trucks—all in one pass.

Removing grouted brick, the Gradall similarly rips and loads in one pass. And because of the smooth Gradall action, most of the brick can be salvaged.

"Tough ones" like these are typical of the wide variety of jobs on which the Gradall can cut costs and speed work to completion. Your Gradall Distributor will be glad to demonstrate how the Gradall can be applied to your particular type of construction work.

Gradall®

DIVISION OF WARNER & SWASEY Cleveland

Gradall Distributors in over 60 principal cities in the United States and Canada

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE *with Controlled Down Pressure*

ROADS AND STREETS

May, 1952 • Vol. 95 • No. 5

Welded Steel Box Girders

USED FOR THREE BRIDGES IN WASHINGTON

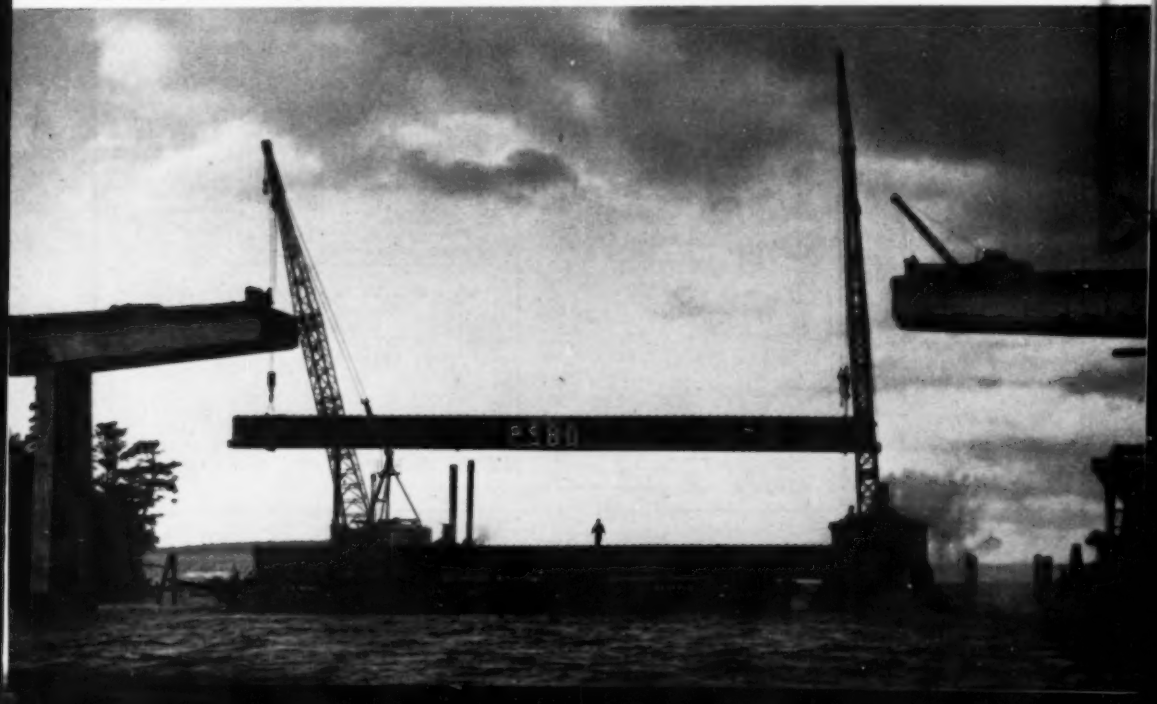
Economy was achieved in unique designs, one of which is described in detail. 140 ft. girder believed record length for Western U.S.

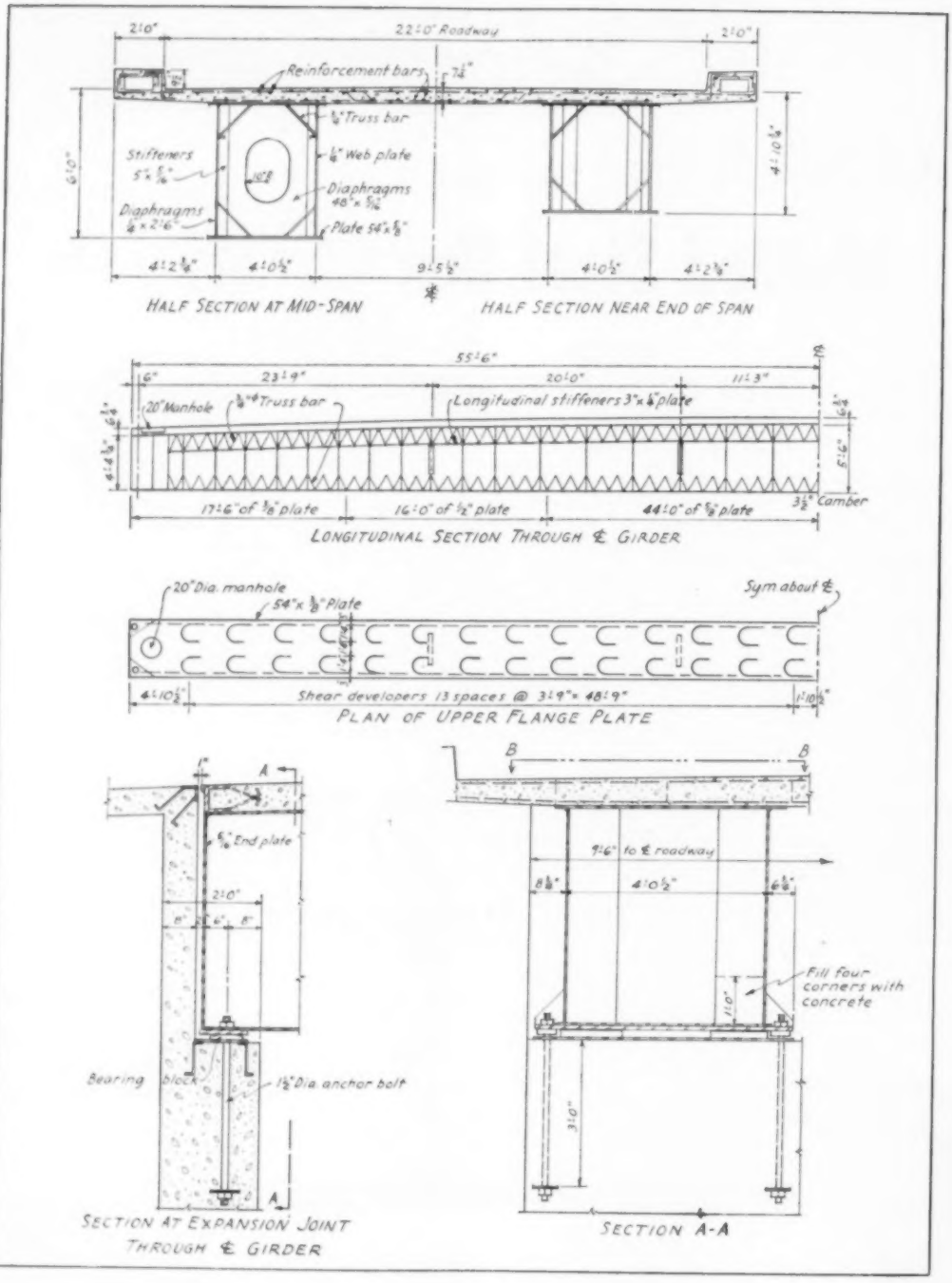
THREE new bridges in western Washington state employ a unique design by Homer M. Hadley, Seattle consulting engineer, in which thin steel plates are welded into rectangular box girders with a consequent saving in steel and erection time.

Most notable of the three is the Portage Canal highway bridge connecting Indian Island with the mainland near Port Townsend. This bridge, with a 22-ft. concrete roadway, is a deck girder structure with spans 40′ cantilever, 170′, 250′, 170′ and 40′ cantilever. The 170-ft. spans consist of two-cell reinforced concrete box girders which cantilever 55 ft. out toward mid-channel in the main span. The central span includes a pair of 140-ft. welded steel box girders, suspended between the 55-ft. cantilevers. These steel girders, each weighing 39 tons, are believed to be the longest west of the Mississippi River.

Manson Construction Engineering Co. of Seattle was the contractor for this state highway structure, with Walter Peterson, superintendent. The girders were fabricated by the Puget Sound Bridge & Dredging Co., at its Seattle waterfront plant, lifted onto a barge by two 40-ton Clyde whirley cranes, and towed to the site. The barge was anchored between scows supporting a 35-ton whirley and a 25-

★ Setting 140-ft. steel box girders, which will connect with cantilevered concrete girder spans





★ Structural details of the 110-ft. steel box girders employed for the Portage Canal highway Bridge, near Port Townsend, Washington

ton steam derrick. Assisted by an A-frame truck on top, lifting of the first girder was accomplished in two hours and lifting of the second in one hour.

Smaller Span Details

Two smaller spans of steel box girder design were built for King County, Washington, D. L. Evans, County Road Engineer. One 110-ft. single span bridge with two box girders is located at North Bend on the Snoqualmie River. The other is a central 100-ft. section of the 200-ft. main span of the Patton Bridge across the Green River, 3 mi. east of Auburn, Wash. The first of these was fabricated by Isaacson Iron Works in Seattle, the second by Puget Sound Bridge and Dredging Co. Because of the frequent possibility of utilizing spans of this approximate length elsewhere, the structural design of the 110-ft. span will be described in considerable detail.

The 110-ft. North Bend girders required 580 hours of welding time and 732 lb. welding rod. The combined weight of the two girders is 80,180 lb. The girders were trucked 30 mi. to the site and backed across a log detour bridge closely paralleling the permanent bridge alignment. Each girder then was skidded sideways onto falsework bents and slid into position on the abutments. With anchor bolt connections completed, the field erection was done.

The North Bend bridge was built by the T. N. Buchanan Co. of Seattle for $36,440, of which $18,597 was for the steel girders together with their portion of the roadway slab and handrails. The contract price included removal of the old bridge, erection of a detour bridge, and placement of a small quantity of rock riprap.

The steel box girders are made up entirely of steel plates with the exception of diagonally inclined trussing bars in their four interior corners and semi-circular flat bar shear connectors attached to the top flange plate. They were fabricated entirely by welding. A ⅝" x 54" plate constitutes the top flange, a pair of ½-in. plates of varying depth form the webs, and butt welded steel plates 54-in. wide and varying in thickness from ⅝-in. to ⅝-in. make up the bottom flange plate. Stiffener plates 5/16" x 5" are welded to the web plates on the inside of the girder only, at 30-in. and 45-in. spacing.

At approximately 20-ft. intervals along the box section are full transverse diaphragms of 5/16-in. plate with a central manhole whose margins are stiffened by an encircling ¼" x 4" plate. At the four interior corners of the box, ⅝-in. round trussing bars, inclined transversely at an angle of 45 deg. to the vertical and bent in diagonal pattern, are welded at their successive contact points to the main plates. These ⅝-in. round bars were bent in a zigzag pattern and were made of one continuous bar from transverse diaphragm to transverse diaphragm where their ends weld to both the diaphragm plate and the flange plate.

After the upper trussing bars were fully welded to the web plates, ¼" x 3" longitudinal stiffening bars were welded to the webs directly beneath the trussing bar and extending in one piece between the vertical stiffeners to which they likewise are welded. Semicircular shear connectors, made of 2" x ¼" flat bars and spaced 30 in. and 45 in. o.c. were welded to the top flange plate at points where the interior corner bars contact the top flange plates, integrating the roadway slab with the box girders.

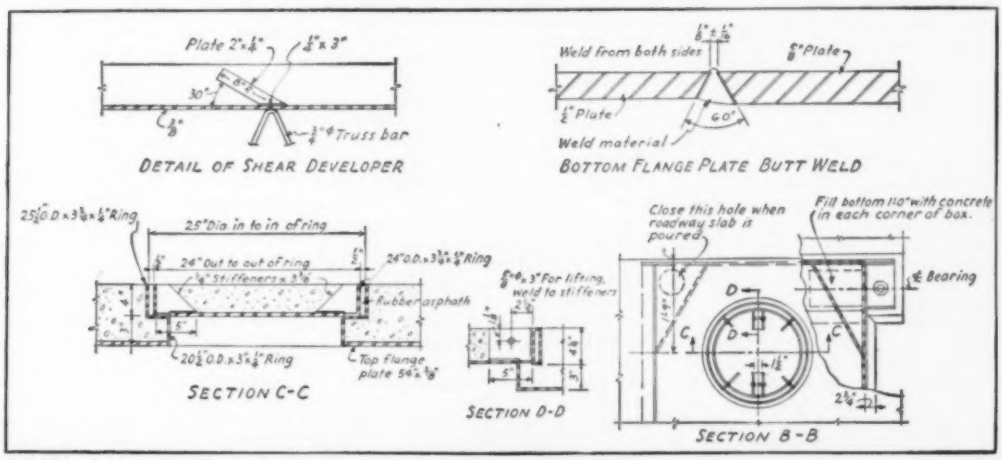
At the ends of the girders, solid 5/16-in. transverse diaphragm plates without manhole openings are employed. The interior girder corners here are stiffened and closed by pairs of ½-in. corner plates that extend from top to bottom of the girder. The bottom 12 in. of the triangular spaces in the interior corners of the box girder, formed by the diagonally placed corner plates, were filled in with Class A concrete made with early strength cement concrete being placed through 6-in. holes in the top flange plate. This filling was made at the shop a week in advance of shipment.

All welding was performed in the shop in accordance with latest Standard Specifications for Welded Highway and Railway Bridges of the A.W.S.

Diaphragm Plates

All joints in the flange and web plates were staggered, no two joints occurring at any transverse section or within 3 ft. of one another. All transverse joints were made squarely perpendicular to the longitudinal axis of the girder, and are of the standard butt type, made from two sides. Transverse joints in the bottom flange plates occur only where the thickness changes. Continuous fillet welds were made, on the outer side only, at the junction of the flange and web plates.

Vertical stiffeners, diagonal trussing bars and longitudinal stiffeners first were welded to the web plates, laid flat. These web plates then were erected and tack welded in true position with the bottom flange plates, after which the transverse diaphragm plates and the special features at the girder ends were installed and con-



★ Additional details of 110-ft. steel boxgirder span

★ A 140-ft. box girder being loaded from dock to barge

★ Under view of completed 110-ft. box girder span

nected. This assembly then was inverted upon the top flange plates and, after the necessary tack weldings were made, the remaining interior welding was accomplished. Continuous main welds at the four corners of the girders then were made from the outside, after which the shear connectors and manhole rings were attached to the top flange.

The 140-ft. Indian Island girders are designed similarly to the King County bridge, except with a wider and deeper section. The diagonal bar corner stiffeners are heavier and more widely spaced longitudinally than in the King County bridge.

The King County bridges have a design load of H15-44 (AASHO) in case of the North Bend structure and H20-44 for Patton, while the 140-ft. Indian Island span is designed for H20-S16-44. Welding inspection was visual. The box girder design was decided upon in each instance because of its economy, according to Mr. Hadley.

Contractors Cautioned on Wage Violations

Ramifications of wage stabilization and drastic penalties involved were explained at the Twenty-Fourth Annual Meeting of the Michigan Road Builders' Association, April 3, by Francis J. Kelly, general counsel of the American Road Builders' Association, Washington, D. C., and chairman, Regional Enforcement Board, Region No. 4, Wage Stabilization Board.

Declaring that wage stabilization regulations must be closely observed, he pointed out in detailing enforcement procedures, that contractors making over-payment of wages may have their entire payrolls disallowed as a deductible item for income tax purposes. He went on to explain that only payrolls for the specific job classifications involved in the overpayment may be disallowed. If a payroll for carpenters totalled $100,000 and the contractor made over-payments of wages totalling $10,000, the total payroll may be disallowed rather than the amount of over-payment.

Complaints are heard by regional enforcement commissions made up entirely of representatives of the public. Contrary to the practice prevailing during World War II, industry and labor representatives no longer have a hand in enforcement procedures. Present enforcement commissions are quasi-judicial, and it is felt that their decisions will be unbiased and rendered on the basis of what will best effectuate the purposes of the Defense Production Act.

Declaring that no wage increases in the construction industry can be legally made without specific authorizations, Mr. Kelly outlined the steps to be taken to avoid violations. Certain limited increases are provided for by regulation but in the majority of cases approval by the Construction Industry Stabilization Commission is required. It is important for contractors to familiarize themselves with the terms of the regulations. Employers in the construction industry were advised to check very carefully the payment of any wage exceeding the level prevailing on July 26, 1951.

Toll Roads Continue in the News

Toll highways continue to make lively news in many states:

Indiana. A supreme court decision was awaited late in April on the constitutionality of legislation creating a toll road commission authorized to issue revenue bonds. Whatever the decision, early construction of a proposed $150 million toll project from the Ohio line to Gary is a remote possibility, according to commission chairman James D. Adams. Indiana's plans must mark time pending unsnarling of legal tangles in Ohio.

Ohio's turnpike project is threatened at this writing by a lawsuit challenging its legality and charging that its legislation violates both the Ohio and the U. S. Constitution.

Pennsylvania. Construction is starting this year on a 33.4 mile $33,000,000 extension of the Pennsylvania Turnpike around Philadelphia. This link will hook into a branch of the New Jersey turnpike and afford a 425 mile non-stop route from New York City to the Ohio state line.

New Jersey. New Jersey voters next November will pass on a $285,000,000 bond issue to build a second turnpike which would connect Atlantic City and other coast resort areas with New York City.

EDITORIAL

Doing a Good Day's Work is Still Fundamental

In private industrial enterprise profit provides the motive for cooperative, productive action. In public work, particularly road work, profit does not enter because government is a non-profit service organization. Therefore, to get productive cooperation—that basic ingredient of economic operation—the leaders or directors of road work must get productive cooperation through sheer leadership of which a well planned, economical procedure is a part. In public road work, honest, conscientious production on the job daily is just as mandatory for job security as is this same effort in private industrial enterprise. Let us cite an example of what happens in individual enterprise when daily job production is less than what is required if manufacture of a particular article is to be continued.

The Woven Wire Fabrics Division of John A. Roebling's Sons Company of Trenton, New Jersey, the oldest wire products manufacturer in the United States, is going to be discontinued. President Tyson states that the reason for this action is that "the Division's productivity had not measured up to that in the woven wire fabrics industry generally, thus contributing in a large degree to Roebling's inability to become competitive in the woven wire sales field."

This company is widely known for its favorable, industrial-family type of management-employee relationships. Yet, in one Division some people were just putting in so many hours per day. Apparently, when those "some people" get a job in this Division they quit looking for work. Unfortunately, some people will do anything to avoid work, forgetting the fundamental principle that every man's value depends on his productivity. Mr. Tyson stressed time and time again the inescapable conclusion that production costs, including wage costs, determined their competitive position, and that waste of time had, of necessity, to be kept at a minimum. Today, these people are faced with an economic truth—they killed a Division because they ignored the basic economic principle that every man must cooperate diligently for most economic production. It becomes fairly obvious, then, that security can be earned only by honest, conscientious production on the job daily.

What has been exemplified above with respect to this Division of a large, well managed, modern manufacturing enterprise is equally true, so far as government is concerned, with respect to the road worker. Of course, "dragging one's heels" on governmental road work will not kill the road department, since the profit motive is not applicable, but it will certainly undermine, if not destroy, the road worker's security. It behooves highway leadership to instill the sense of loyalty of cooperation such that the road worker's security *can* be earned by honest, conscientious production on the job daily.

Monday Morning Quarterbacking on the Morocco Job

The contractors and others on the Moroccan Air Base project have taken a shellacking, as the result of one-sided publicity emanating from the congressional hearings in Washington. Atlas Constructors in particular should be given a chance to tell their side of the story in full.

Unfortunately accusations make better headlines than rebuttals, especially when the replies are delayed until public attention has flagged.

Serious distortions of facts on the Morocco project have crept into the press in the U.S. and Europe. The ROADS & STREETS editor after spending three intensive weeks in Morocco doesn't feel qualified to pass judgment on the management, except to note that hundreds of able engineers and contractor men have given the project their all-out best as individuals—and that this goes also for the construction firms in the Atlas group as companies. These reputable companies have little to gain and much to lose by doing anything less in the Morocco joint venture.

The on-the-scenes report presented in this issue is confined to engineering problems, design features, construction methods, and accomplishments to date on the airstrips which make up the principal "heavy" construction end of the Moroccan project. A careful reading of this report will, we feel, serve to swing the spotlight from the controversies to the rather remarkable accomplishments.—Harold J. McKeever.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

REPORT ON THE

Moroccan Air Strips

This article on the Moroccan air base project reviews some of the beginning events and discusses site location, grading and aggregate production, and the design and construction of the airfield pavements.

By Harold J. McKeever

Editor of Roads and Streets

THE French Moroccan air base project, while involving the largest single contract ever awarded by the Corps of Engineers (initial estimate $300 million), is not the biggest offshore base job in history. Nor are its conditions the most difficult. But difficulties there have been, aplenty. The great speed of the project's initiation and "crash" phase, combined with the necessity of improvising methods and maintaining production in the midst of fast changing concepts of military defense, created many headaches. The following article will describe some of the project's events and details. It will be confined principally to the engineering and construction of the airstrips.

The day-by-day events of the "crash" program,* which began in December, 1950, can never by fully chronicled or appreciated by laymen. Engineers and contractors made their first landings in January. On July 14—France's Bastile Day—two heavy duty air strips, each 200 ft. wide by 9,000 ft., together with related taxiways and partially completed aprons, were operational and received their first planes. This was a remarkable accomplishment, one strip being built from scratch in 83 days beginning April 22 and the other in 68 days, beginning May 9. In these periods the contractors reached a peak of 2,000,000 cu. yd. per month; produced, placed and compacted rock and gravel for heavy base courses; completed 450,000 sq. yd. of hot asphaltic mix, placed in two courses; and began the many related tasks which mark the early phase of a major base establishment. The construction pace established for the "crash" program was maintained throughout the year.

*This term in newspaper parlance means the early high-speed construction to make minimum facilities operational.

Organizing the Job

Col. George T. Derby was taken from the Norfolk District of the Corps of Engineers and made chief of the newly created East Atlantic District (Morocco) to handle the job. Beginning in January of 1951 he was given six months to mobilize and build the project. The initial plan was to enlarge four strips built for the wartime African invasion, and to build one new airstrip for minimum operational facilities. These existing fields were Rabat-Sale, Meknes, Marrakech and Khouribga. One by one the old fields were dropped from the project either by reason of excess cost or local political reasons. By April it was decided to build five entirely new bases at Nouasseur, Sidi Slimane, Mechra-bel-Ksiri, Ben Guerir and Louis Gentil. Ksiri and Gentil were subsequently dropped in favor of other sites. Nouasseur and Sidi Slimane were the scenes of the first air strips on which planes were landed July 14, 1951.

★ Translated into English this sign in Arabic says just what you think it does—part of a Safety and Accident Prevention campaign among Morocco air base workers, made difficult by the mingling of many racial types and tongues

★ Morocco air bases are strung along the country's interior at locations determined after investigation of 89 possible sites

By the end of 1951 the initial 450,000 sq. yd. of completed pavement had been increased to 2,200,000 sq. yd. of airfield paving. In-place construction represented approximately $49,000,000 with a large volume of work in progress. By April this year four hundred thousand tons of heavy construction machinery had been shipped to Casablanca, supplemented by tons of other critical cargo shot in by the Military Air Transport Service's flying boxcar shuttle.

Many of the quantities in the job have grown to double or triple the estimates on which the original procurement program was based. For example, at Nouasseur alone over 4,900,000 cu. yd. of airfield dirt had been moved by April 1952, and another 2,200,000 cu. yd. for warehousing, underground utilities and miscellaneous excavation. This was more than had been anticipated in the original concept for all five bases together,

due largely to the necessity of stripping heavy layers of top soil which proved unsuitable for use in the airstrip sub-base. Since the crash program, construction has continued at both Nouasseur and Sidi Slimane, and as of April this year the Ben Guerir Air Force Base had been started. Here a 14,000 ft. runway was in the fine-grading stage, while production of paving aggregates was begun with equipment dismantled at Nouasseur and Sidi Slimane and erected for second use at Ben Guerir. Site investigations were still in progress at a field known as Boulhaut and a fifth base, Djema Sahim, was in the preliminary planning stage.

With this quick rundown let us look at some of the detailed events, organizations and procedures.

Engineering Management

Through the first months beginning with Colonel Derby's initial investigations in Morocco, he divided his time between initiating construction in Morocco, and attending conferences in Paris and the United States. Lt. Col. L. L. Haseman, Deputy District Engineer, who joined Col. Derby in Rabat late in January, was in local charge in Morocco from March 1 to May 22, and spearheaded and coordinated site investigations during the first months and the initiation of construction at Nouasseur and Sidi Slimane. Colonel Derby and Colonel Haseman were at this time the only engineer officers assigned to the project. During this early stage of operation, Colonel Derby was assisted by a small staff of civilians in Morocco.

In May, 1951, the U. S. Air Force under Maj. Gen. Archie J. Old, Jr., established Fifth Air Division headquarters at Rabat, capital of French Morocco, and a French Liaison Mission was established to expedite intergovernmental relations.

The original Corps set-up depending heavily on civilian engineers prevailed until this past winter when officers of the Corps of Engineers were placed in key positions. This change has been effected, with the experienced civilians remaining in important positions. In April, 1952, Colonel Derby was succeeded as District Engineer by Colonel J. P. Campbell, from the Corps Chicago District. The Corps' function throughout the first fifteen months has been to approve plans and inspect along broad lines, to insure compliance with Corps of Engineers standards and procedures and Air Force requirements for aircraft operations.

★ The temperamental character of the rock available for base aggregates was one of the unexpected problems in Moroocco. (Corps of Engineers Photo)

Carrying the engineering load is the Architect-Engineer firm known as "PUSOM." This spring PUSOM had about 600 personnel in Morocco and 200 in New York, representing a gradual building up in the task of recruiting top qualified geologists, field engineers, soils and paving men, and other specialists.

As of late April, this year the Moroccan contractors, Atlas Constructors, was working a labor force consisting of 4,300 Americans, 8,000 Moroccans and 3,000 Europeans. Work on airstrips and certain other types of installations proceeded on a round-the-clock basis during the crash program.

★ Building the operations apron at Sidi Slimane Air Force Base, Franch Morocco—part of the remarkable 68 day "crash" program. Note gravel base layer in position over fine wind-blown sand, glimpsed at left side of picture. Asphaltic binder course being placed at right in distance. (Corps of Engineers Photo)

★ At left is a corner of one of the winterized tent cities which housed thousands of workers and engineers. At right an example of the more permanent Quonset buildings taking shape on the various bases along with better housing. (Corps of Engineers Photo)

Preliminary Engineering

Site investigation has proved to be a formidable part of the Moroccan job. This work began in January, 1951, with the landing of a 6-man reconnaisance party headed by O. J. Porter, A. R. Butler and Bruce McCreary. The advance group grew to 60 in February and 260 by June. Within the year no less than 89 sites scattered over 40,000 sq. mi. had been investigated, each to the extent of obtaining some data on the four essentials: availability of water, availability of construction materials, foundation conditions, and flight approach conditions.

★ Power loader seen at work at Nouasseur Air Depot in Morocco, where earth-moving last year exceeded 1,000,000 cu yd. per month at times

★ Not only airstrip paving but warehouse floors were built with bituminous mix

In this work the engineers were hampered by many unusual difficulties. While the French had developed excellent geological maps for the country, meager data existed on the engineering properties of the soils and rocks. Many restrictions were placed on the acquisition of land for base sites, and the French and Moroccan officials consumed considerable time in reaching the initial agreements. Land for the bases, each of which requires many square miles, is owned by the French government and occupied by the U. S. Air Force on a loan basis. Much of central and northern Morocco is rich farm land, and under a policy of using marginal land wherever possible the reconnaissance engineers had to observe sound engineering practices. Such a seemingly minor matter as an Arab cemetery, which can not be moved under local Cherifien law, often ended a site study. (Note: In an ancient country such as Maroc there are numerous small cemeteries, scattered in the most unexpected spots, that appear forgotten but are carefully guarded.)

But most complicating of all circumstances in site selection was the fact that the criteria for the air bases were themselves in a state of flux. While dimensions for runway width and length were reasonably certain, no one knew in advance of borings and laboratory tests whether a pavement built of available materials would have to be 10 in. or 20 in. thick, whether material sites would have to be found and purchased for producing a few hundred thousand tons of stone or gravel, or a million tons. Earthwork quantities, too, were dependent on yet-undecided concepts, and in a rush job where quantities should be kept to a minimum, cut and fill patterns for yet-undeveloped layouts and designs would inevitably help dimension the site.

Preliminary reconnaissance was

Who's Who on Moroccan Air Base Project

During the pioneering stage of the project the Corps of Engineers civilian staff under Col. Derby and Col. Haseman was headed by Mr. L. S. Coy, Assistant Chief of Engineering and Operations; Mr. Jack O'Connor, Supply Officer, who was also acting as Executive Officer, and three area engineers; Joe Walker, Frank Lyman and Paul Gill. Mr. L. E. Bozarth, Chief of Engineering and Operations; Mr. O. M. Jernigan, Chief of Engineering Branch and Mr. J. H. Pruhs, Executive Officer were detained in New York to mobilize and direct the procurememnt of equipment and material and shipment. See article for succeeding events and personnel changes.

Today the Corps with Moroccan headquarters at Nouasseur, 23 miles inland from Casablanca, has a staff of about 130. The mail address of personnel is via Corps of Engineers, East Atlantic District, APO 30, U.S.A.F., % Postmaster, New York, New York.

The name PUSOM stands for a joint venture Architect-Engineer firm compounded of Porter-Urquhart, foundation and paving engineers, of Newark; O. J. Porter & Company of Sacramento and Los Angeles; and Skidmore, Owings & Merrill, of New York, Chicago and San Francisco, large designers of overseas housing and base buildings. This combine is aided on a related Moroccan pipeline project ("P.O.L." for petrol, oil and lubricants) by Fay, Spofford and Thorndike of Boston, and on diesel-electric power plant design by Guy B. Panero of New York City, both as sub-contractors.

PUSOM's job, under the direction of the Corps of Engineers, is to develop site information necessary for design, prepare designs, and perform control testing and inspection. Its management is vested in a Governing Board consisting of N. A. Owings, chairman, O. J. Porter, Leonard Urquhart, Walter Severinghouse and Louis Skidmore. Stateside operations are headed by Robert Wagner with headquarters at 575 Madison Avenue, New York.

★ Dan Teters, construction manager of Atlas Constructors, with Tom Doyle, project manager, at Nouasseur Air Base

★ Roads and Streets Editor Harold McKeever (center) with Bob Durr, area engineer, and J. P. Burris, project manager, at Ben Guerir air base in Morocco

PUSOM's operations are directed by Jan Porel, general manager, with E. S. Merrill, assistant general manager; William H. Jervis is in charge of engineering; A. H. Griffin is chief engineer; H. L. Conger, asst. chief engineer; C. F. Craig, asst. to the engineering manager; Bruce McCreary, chief of field engineering; Louis Scesa, architectural manager; Frank Holloway, construction manager. Design department heads include W. S. Gray, J. R. Yarrow, S. J. Scarriaferro, E. B. Kelsey and A .L. Lockett.

PUSOM has a project engineer and aids on each base job, in charge of control testing and inspection and serving as the AE with the Corps area engineer. These are Ed Sanel (Sidi Slimane), F. E. Basel (Nouasseur), Robert Hall (Ben Guerir), F. F. Viet (Boulhout). PUSOM's overseas employees get mail at Casa Postale 879, Casablanca, French Morocco.

Atlas Constructors

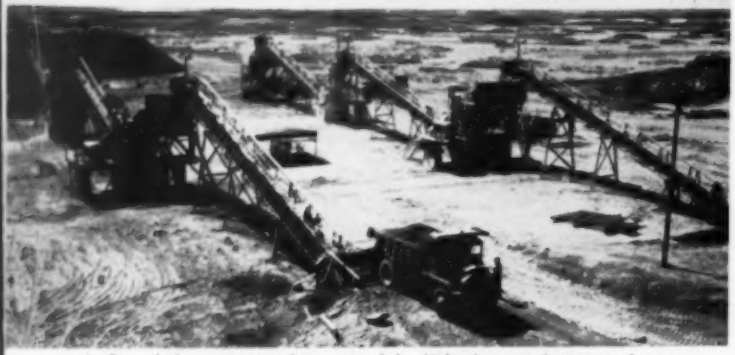
The spectacular part of the Moroccan show is Atlas Constructors, cost-plus-fixed-fee contractors for the entire base project. Atlas is a joint venture firm made of Morrison-Knudsen Company, Inc. (Boise, Idaho); Bates & Rogers Construction Corporation (Chicago); Ralph E. Mills Co., Inc. (Salem, Va.); Blythe Bros. Company (Charlotte, N.C.); and Nello L. Teer Company (Durham, N.C.).

Atlas has New York headquarters at 42 Broadway in charge of L. E. Manning. Its overseas employees are reached at Atlas Constructors, Boite Postale 14, Casablanca, French Morocco.

Management of Atlas Constructors centers in an Operating Committee consisting of J. D. Bonny, chairman (v.p. and g.m. of Morrison-Knudsen); Ralph Mills (pres. Ralph E. Mills Co.); C. N. Whilden (v.p. Blythe Bros.); and James D. Clary (asst. to g.m., M-K). Lyman Wilbur, a vice president and top engineer in M-K is the resident partner in Morocco.

Heading up the Atlas firm from the start is N. D. Teters, construction manager, with J. D. Ross and H. E. Echols, assistant construction managers, respectively for construction and administration. Two equal ranking division managers are Otto E. Ludwig, buildings, and C. P. Waller, construction. A. W. Campbell is chief engineer, E. B. Shaver is foreign business manager and W. W. Hunt is manager of equipment and transportation.

Each base project is directed by a project manager with wide authority, made necessary by the fact that the bases are strung out 50 to 130 miles apart and communications are poor. (A plane and radio have helped lately in emergency interbase contacts). Project managers include Thos. J. Doyle at Nouasseur, J. E. Noonan at Sidi Slimane, J. B. Burris at Ben Guerir, J. T. Love at newly started Boulhaut (formerly was at Sidi Slimane), and W. W. Hooton on the P.O.L. job.



★ One of the aggregate plants erected for high-volume production at the Moroccan bases. Original crushing equipment was for straight-line plants such as this, with no re-circulation

★ Here seen are three portable crushing plants, used at one airstrip to reduce 1½ in. maximum crushed materials to a finer gradation. (Roads and Streets photo, April, 1952)

★ Above is the diesel powered source and below the complete plant operating today at Sidi Slimane Air Base for large-sale crushing, screening and washing to produce sand aggregate (R&S photos)

hampered by lack of adequate personnel and testing equipment as the geological program expanded. The original landing party found a truck locally equipped with a power auger. Two additional augers were airlifted from Europe. They were aided in getting about by good telford-base asphalt roads built by the French engineers. A laboratory was set up at the Public Works Department in Casablanca for soils and aggregate testing. As additional equipment arrived during the first months, a beginning was made by developing design criteria for two fields. In the first month alternate locations were investigated for the field now called Ben Guerir, the party covering fifteen sites in a 1500 sq. mi. area.

Drafting of specifications for the Moroccan project was begun by the Architect-Engineer on the first of April, 1951. Sand-cement base construction which was considered for a short time at Sidi Slimane was abandoned because of the availability of gravel pits and the lack of mixing equipment for sand-cement base.

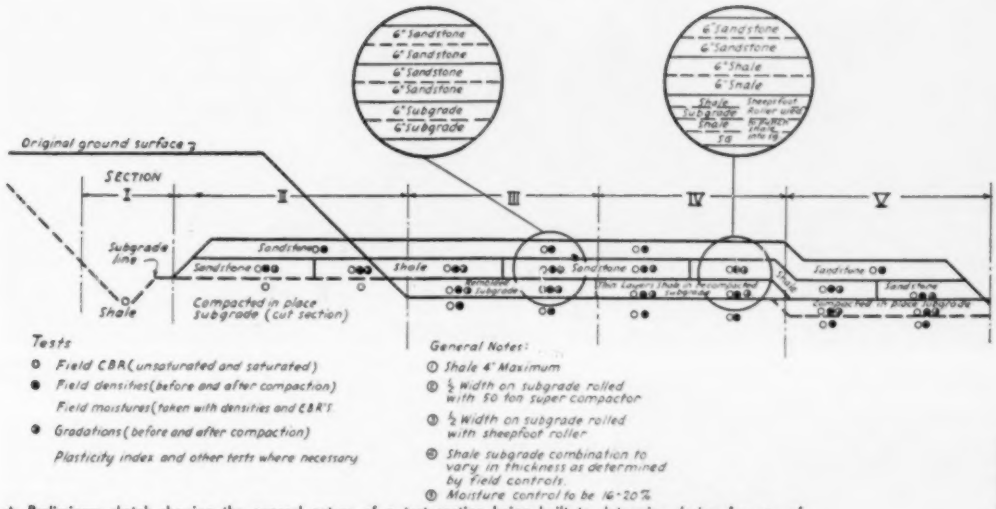
Following U.S. and French Air Force agreements, modifications were made in the Nouasseur Base Depot layout involving changes to conform to future expansion. This necessitated very great activity by the Field Engineering Soil Section and Survey Crews of the AE in order that sufficient data could be made available on which to base design and earth work quantities. Considerable difficulty was encountered in producing a uniformly graded aggregate, and the specifications for the base course material were revised in the early stages at Nouasseur. This was due to the necessity of crushing quartzite with equipment purchased to process the limestone indicated by the first reconnaissance as the source of aggregate for the project.

The foregoing example gives a mere glimpse into the evolution which took place in a period of urgency when a long "lead time" was required for any heavy construction equipment not already on hand.

Test Sections Used

Test sections were built at each field under the direction of the Corps of Engineers as a quick method for obtaining runway design information, an elaborate one being employed at Sidi Slimane. A test project was in progress this Spring at Boulhout.

This field involves a residual soil bordering on lateritic, rich in cemented nodules and having a highly plastic clay matrix. This test (see sketch) comprised five parallel zones each 50 ft. wide by 100 ft. long—one



★ **Preliminary sketch showing the general nature of a test section being built to determine design for one of the Moroccan air strips. Test sections built for testing with heavy rollers have played a prominent part in the Moroccan program**

in cut, one in transition from cut to natural subgrade, and three involving various proposed combinations of subgrade and base layers. The test included compacting subgrade and base with heavy tamping and pneumatic rollers of various loads. For each test zone a detailed instruction sheet was issued giving specific steps in the test operation, and who was to perform each step beginning with the contractor's scraper work.

A Central Testing Laboratory is nearing completion for the Corps of Engineers at Nouasseur. This laboratory, housed in a 40 x 100 ft. Quonset, will handle all soils testing, and also constitute a complete physical and chemical testing center for building materials and equipment incorporated into the project. Equipment includes a 200,000-lb. universal testing machine obtained from Germany. The laboratory will prove specially useful in testing materials and equipment purchased in Europe or elsewhere outside the U. S., for which engineering data may be lacking. It will also serve the Corps' new Mediterranean Division, for which headquarters were established at Casablanca in April with Brig. Gen. Orville E. Walsh in command.

Air Strip Design

The airfield pavement design was specified to consist in general of the following elements:

(1) A natural soil subgrade compacted to at least 95 per cent modified AASHO density (100% modified at Sidi Slimane where sand was involved), and having a specified CBR value variously ranging from 10 to 30, depending on the soils.

(2) Crusher run stone or gravel base, consisting of two or three courses totaling 12 in. thickness or more, with a CBR value specified for each course. This value was usually set at 35 for the bottom course and 80 for the top course.

(3) Two 2-in. courses of hot asphaltic mix, designed to have a Marshall stability of not less than 1,000, a flow of 10 to 15, and voids in the compacted mix of 3% to 5%. Asphalt of 85 penetration was specified for all work.

A ' the sites chosen have been relatively flat, involving comparatively shallow cuts and fills.

Quality control on base aggregates

Equipment on Morocco Airbase Project

The Moroccan accomplishment has been made possible by a formidable spread of heavy machinery, with more equipment on the way in. Over $20,000,000 worth of heavy equipment was procured for the "crash" job, including $2,000,000 worth from the contractors —all now owned by the Corps of Engineers. The list on April 1, 1952, included thousands of items. To name just a few:

Tractors, dozers, etc.	144
Crawler tractor drawn scrapers	20
Self-propelled scrapers	57
Power shovels, motor cranes, etc.	76
Motor graders	95
Flat steel asphalt and stone rollers	30
Sheepsfoot rollers	10
Pneumatic tired compactors	27
Bottom and end dump wagons	96
Dump trucks	167
Flatbed trucks	175
Miscellaneous trucks and trailers (not incl. pickups)	340
Tank trucks and trailers	66
Wagon drills	75
Compressors	57
Welding machines	136
Diesel power units and generator sets (40 to 100kw)	102
Power wagons (on pipe line)	45
Asphalt finishers	12
Truck mixers on heavy trucks	40

Electric power for depot operation and construction needs was supplied at the beginning by diesel generator sets in 50- to 75-kw installations. These were necessary because of a shortage of electric power and the 50-cycle current used in the Moroccan utility systems. These plants are being relegated to other uses, when supplanted by permanent installations in the 1,000- to 2,500-kw category. Smaller diesel generators are required to power the aggregate and hot mix equipment at the three bases.

Each base has an equipment shop complete with departments for heavy equipment, trucks and cars, welding, and for such services as woodworking, painting, heating and sheet metal, and electrical work required in the base construction program.

★ Topping out the base for the 14,000 ft. airstrip at Ben Guerir Air Force Base in Morocco. Note extra long blade on motor grader, made by welding two normal length blades together.

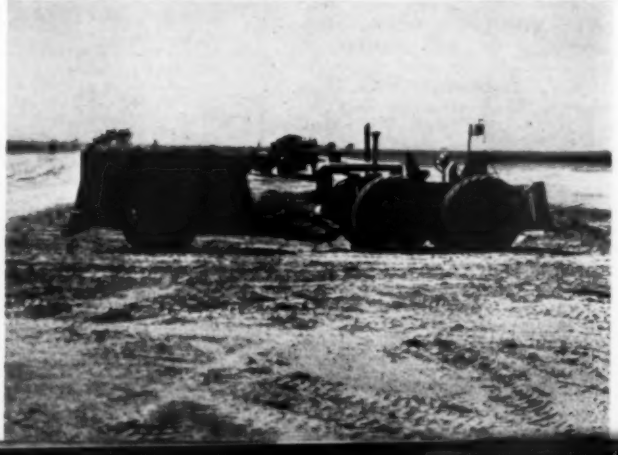
★ At Ben Guerir Base, concrete pipe under runways is being backfilled with ready-mix concrete to provide load carrying capacity

★ Hundreds of miles of trenching for utilities was largely done by mechanical ditchers and backfilled by loader scoops or bulldozers.

★ Something of the size of the quarrying operations at one of the Bases can be seen in the number of compressors shown in this single hookup

★ (Left Below): Extensive rock outcroppings added to the cost of the long flight strip now under construction at Ben Guerir Air Force Base. Arab and Berber workers are operating the jackhammers.

★ (Below): One of many 50 ton rubber tired compactors used in securing subgrade and base density in Morocco.

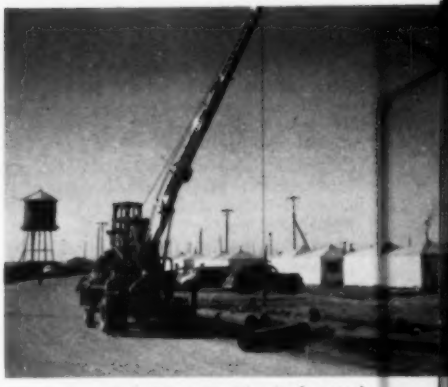


Moroccan Air Base Project as Seen by The Roads & Streets Editor, April, 1952

Most of these scenes are of airstrip base construction at Ben Guerir Air Base

★ Slimming by scrapers in progress in the midst of rock outcropping removal at Ben Guerir Air Force Base.

★ Another large compressor station—at the quarry supplying base and hot-mix stone for Ben Guerir Airstrip (R & S Photo)

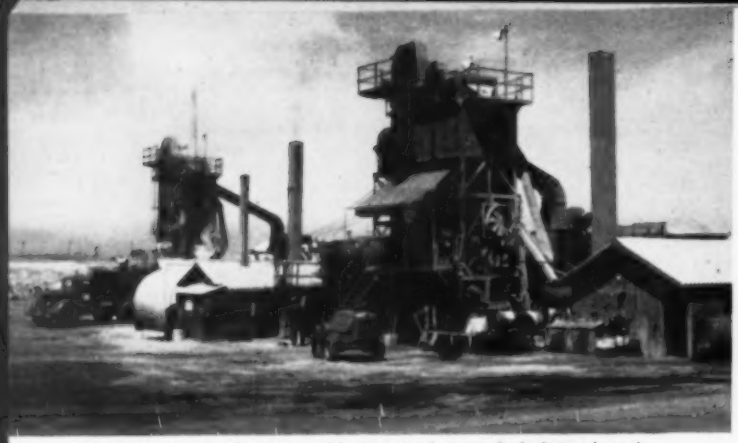


★ Setting water pipe in the trench with hydraulic crane at one of the base camps. Note Dallas huts for Air Force personnel, and water tank in background

★ At each of the air depots Atlas Constructors have a large shop area, with facilities for overhauling heavy equipment and repairing and servicing other types of equipment.

★

★ Scrapers fine-grading subgrade and topping out base courses in a high speed skinning operation, Ben Guerir Base, April, 1952.



★ Asphaltic mix for the airstrips while deviating from standards during the early phase of the 1951 program, today conforms fully with the best American practice for high-stability asphaltic concrete. (R & S Photo)

was an overshadowing problem throughout. In January of 1951 Ralph E. Mills of the Atlas Operating Committee and Col. Derby, District Engineer, discussed the specifications for base rock. The district engineer decided in the absence of plans and specifications and of any knowledge of the type and character of materials to be crushed—and in view of the utmost speed required—that the base course would consist of 3½ in. minus crusher-run materials without intermediate screening. On the basis of this decision by the district engineer, Atlas Constructions proceeded to procure and ship crushing equipment capable of producing only crusher-run base, not graded materials.

Early in April the District Engineer gave Atlas tentative specifications for gradation and quality of crushed rock base course. The Atlas managers claimed that it would be physically impossible to produce material to these specifications, which called normally for 2½-in.-minus stone. Stone would have to be crushed to about 1½-in.-maximum size in order to provide the specified percentage passing ¾ in. and smaller screens—which would require a large number of very complete aggregate plants with flexible provisions for screening and recirculating.

Also Atlas was not given any advance information that an appreciable amount of gravel would have to be processed—country rock being the anticipated material. As it turned out, the base for airfield pavement for the second site selected—Sidi Slimane—was produced from gravel deposits on decision of the District Engineer.

To produce crusher run material from rock, Atlas originally brought in fifteen straight-line crushing plants with no provisions for recirculating. Each plant was to consist of two crushers with a secondary crusher set at 3 in. opening so as to produce material 85% passing 3 in. and about 100% passing 3½ in. Changing over to any other type of equipment during the period of delivery of this equipment—as was considered—would have entailed a delay of 120 to 150 days.

Coming back to the problem of crushing gravel on a large scale for the Sidi Slimane airstrip base courses, an agreement was reached between the engineers on an improvised base course design, involving use of somewhat finer rock in topping out, with sprinkling done only after spreading. Throughout the rest of 1951 the crusher run specification was in force, although there was discussion of various methods of modifying the materials such as by the introduction of percentages of ¾ in. asphalt mix aggregates.

At Sidi Slimane—and remember this is the airstrip built in a little over two months—permission was granted following material tests near the start to utilize pit run gravel for the lower base course, to expedite completion by the deadline. Remember, again, that Sidi Slimane was an entirely new base—involving more excavation, base rock tonnage, and paving yardage, than was anticipated for enlargement of any of the wartime airfields set up in the original crash program.

Notes on 3 Fields

Following are notes on soils and aggregates for airstrip construction at each of the three base projects under construction.

Nouasseur. The soil prevailing here consists of a calcarious material in the silty clay classification, locally known as "tufa" (not volcanic). Tests show it to be a good foundation material when properly processed, with a high bearing value in the dry due partly to cementing properties. Moisture incorporation during construction operations was a constant problem, the material being highly water repellent up to a critical point near the optimum, then quickly losing stability. Compaction was obtained, despite the speed of grading, using various types of rollers.

In addition to the difficulty of blending water with this material, there was a problem of securing adequate water in an arid country.

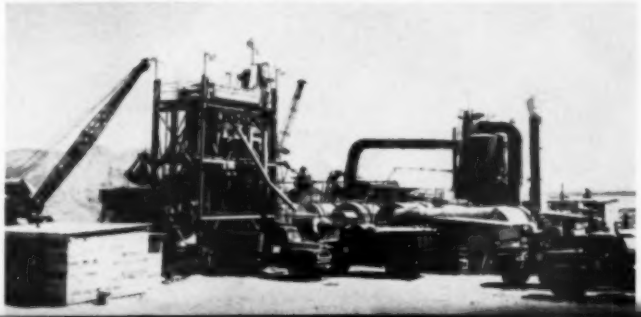
The top of the foundation, here as at all fields, was pretested with a 100 ton pneumatic roller.

For base aggregates a quartzite was found in abundance, but this material—one of the hardest known, and very tricky—became a headache to the contractors and was very hard on equipment. The first crushing equipment included an assembly of uits from available supply, with a jaw and a roll in each of three parallel lines.

The base here consisted of two 4½-in. compacted thickness courses of 3½-in. crusher run stone mix; and a 3-in. compacted thickness leveling course of 1½-in. mix. This was for taxiways, runway ends and aprons. The interior zone of the runway was built to a slight reduction in thickness.

Sidi Slimane. At this field the site materials consisted of fine wind blown sand, uniform in gradation, with nearly 100 per cent passing a 40-mesh sieve. Properly placed, rolled and confined, this sand made an excellent founda-

★ As with the base course construction, hot mix construction was hampered by early difficulties in securing aggregates of satisfactory gradation and other characteristics. (Corps of Engineers Photo)



tion. A specification of 100 per cent density by the modified AASHO method was established for this field. Rolling was tried with pneumatic tired rollers but the sand pushed out. The compaction was eventually achieved by first placing the lower 6-in. course of base stone and compacting through this base with heavy pneumatic tired compactors. Densities above 100 per cent modified were thus obtained.

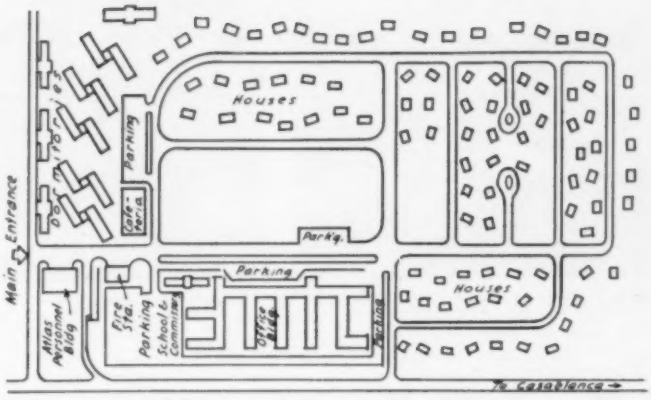
Gravel was abundantly available for base construction, but the material was found deficient in intermediate sizes and the pits spotted with clay pockets, necessitating much wastage to obtain suitable material. Pit-run material was placed for the lower base course and crusher run material for the upper as previously noted.

Ben Guerir. This job, located to the South near the Atlas foothills, lies in semi-arid terrain. The topsoil is a fine wind blown material, uniform in graduation and extremely difficult to compact. Sandy clay was also encountered, as part of a shallow overburden with rock everywhere near the surface.

The rock underlying this field deserves special mention. Like the rock underlying much of Morocco, it is a limestone whose upper layers have leached out and been redeposited, forming a calcarious surface crust of irregular, fissured contour. The rock at this site is filled with silt pockets, which had to be dug out.

The uncertainty of this situation resulted in adapting a design CBR of 10 for the subgrade and going to a thicker base. A leveling subbase course of crusher run limestone was first spread, followed by uniform base courses (See photos by the Editor.)

Because of numerous outcroppings, grading the strip was a slow and tedious job. One 3300 ft. section of this strip is in shallow cut and had to be blasted all the way. Elsewhere on the strip numerous boulders had to be drilled and blasted in the midst of ripper operations and scraper skimming.

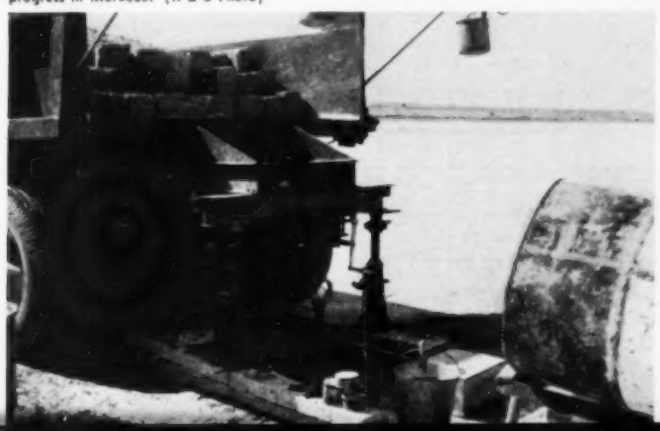


PLAN OF TEMPORARY CONSTRUCTION VILLAGE OF NOUASSEUR

★ Plan sketch of the Atlas camp at Nouasseur air depot in French Morocco. Several thousand workers are housed and fed in this camp, which is immediately adjacent to a large motor pool and shop area

★ 100-ton Supercompactor at Nouasseur airstrip

★ A test rig set up as part of the pavement evaluation program recently in progress in Morocco. (R & S Photo)



Compactor Experience

General observations are in order on the use of heavy pnuematic tired compactors. Twenty-two 50 and four 100-ton compactors and one 200-ton unit were brought to Morocco. Another 200-ton unit is now being delivered. In general the 100-ton units were used for subgrade and base course compaction at Nouasseur, with use of the 200-ton machine restricted to compaction at the lower base, confining the sand, at Sidi Slimane. Final testing has been done with the 200-ton roller at Nouasseur before moving to Ben Guerir.

Some of the Moroccan engineers' point of view is that while the entire pavement cannot be subjected to laboratory tests, every square foot can be covered by a pretest load passage speedily and economically. This load is heavy enough to reveal weaknesses. They feel, moreover, that the 120-150 psi tire pressures of the heaviest compactors reasonably approximate the load conditions imposed by anticipated aircraft. All work will be, or has been, subjected to the 200-ton roller tests.

(*Continued on page* 123)

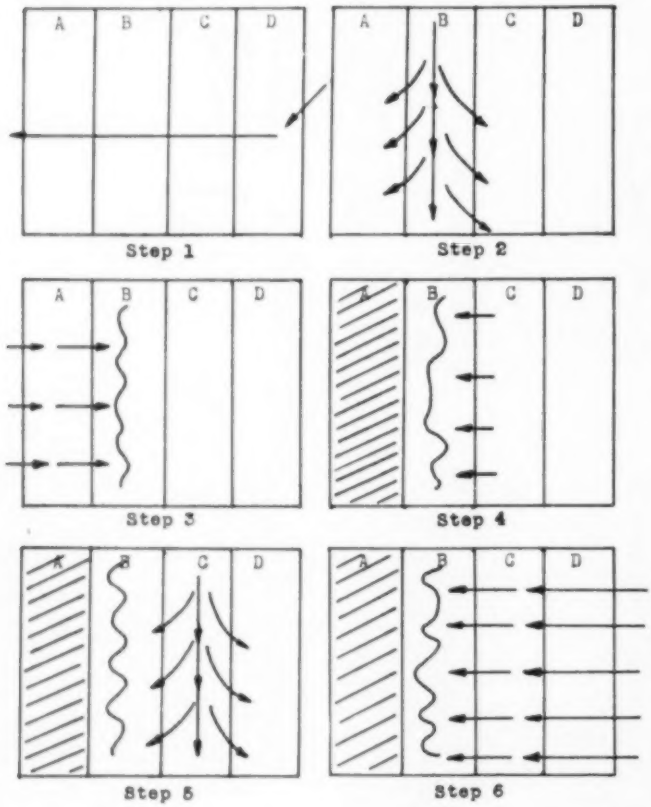
★ Rock rake in action on the Atlantic Boulevard project, Jacksonville, Florida

Rock Rake Simplifies Slab Removal

HOW best to go about breaking up and removing an extensive yardage of old concrete pavement, was a problem encountered on a Florida road reconstruction project recently. The task, which involved removal of 0.7 mile of 4-lane concrete, 6 to 8 in. thick, was encountered in the redesign and repaving of a section of Atlantic Boulevard leading to the Jacksonville beach resort area. The route carries heavy traffic, which had to be maintained.

The Duval Engineering and Contracting Company, which had contracted to take out the old pavement and lay the new one, started by bringing in a crane equipped with a 3900-lb. tear-drop ("skullcracker") hammer. This was dropped on the pavement at about 4 ft. intervals from a height of 15 to 20 ft. At the point of impact, the ball sank 3 to 5 in. into the concrete, usually causing cracks ⅛ to ¼ in. wide between the impact points. A Caterpillar D7 tractor with 7S bulldozer, equipped with a Fleco 10-tooth rock rake, ripped up and piled the concrete slabs, weighing up to 3 tons each.

It was necessary to pile the slabs so as to leave two of the lanes open to traffic over the soil base during the two week period between the time the ripping and piling was completed and the time the slabs were hauled away. Designating the four lanes as A, B, C & D (see accompanying sketch), the tractor operator proceeded with the ripping and piling in the following manner:



Steps in Removal

(1) The pavement edge was approached at a 45 deg. angle and the points of the outside teeth forced under the slab and ripped up. With this start, the rake ripped out a section across the highway from shoulder to shoulder.

(2) The tractor then ripped straight up the lane B, pushing the broken concrete into lanes A and C.

(3) In the third step, a series of transverse passes were made from the

shoulder through lane A, breaking and piling into lane B, which was previously cleared for final placing of the windrow.

(4) Loose concrete was raked off lane C, back into lane B. This step was omitted at first, but it was found that unless this was done, the amount of concrete was too great for efficient piling in the next phase of the operation.

(5) The fifth step was to rip straight up lane C, the same as the first operation in lane B.

(6) In the sixth and last step, transverse passes were made from the other shoulder, ripping up lane D and piling this and the loose slab from lane C onto lane B. This put all of the windrowed piles in lane B, leaving C and D clear for temporary traffic.

There were two cases in this operation where the above procedure could not be used. In one was where a parking strip 12 ft. wide and 50 ft. long had to be torn up. It was bounded on one side by pavement which was not to be disturbed, and on the other by curbing and sidewalk also to be left intact. Stores with plate glass windows abutted the sidewalk, so the skull-cracker could not be safely used. The operator was able to get the teeth points under the slabs and rip them up without disturbing the pavement or curbing. The curve of the rake teeth made it possible to get a hold and start the ripping without having to go deeply to get in under the pavement.

In the other case, it was desired to keep broken slabs cleared from two sections of the road where there were intersections, so that traffic could get through. This was done by breaking in at the side of the road, as already described, and piling the slab back on either side of the intersection. The ability of the rake to do this without removal of any of the dirt off the road-bed made it unnecessary to backfill at the intersection to maintain traffic.

Possible Alternate Method

Working behind the tractor was a crane rigged with a clamshell bucket which loaded the slabs into very large capacity (25-ton) trucks. An orange peel was later brought to the job, but not observed in operation, although the large size of some of the slab indicated that it might have been used advantageously. The tractor operator stated that the work could have been done faster if the teardrop hammer had been dropped at 10 ft. intervals instead of 4 ft. Removal equipment previously used required more the frequent drops. Use of the rock rake allowed the tractor to handle much larger slabs and speed up the work. In addition, with the rake, there was no dirt in the load, allowing more slab per load. It was also pointed out that the loading could progress much faster with the larger slabs, in that the clamshell could get a larger load in a large slab, and load it faster, than it could in trying to pick up several small slabs at one time.

Finally, fewer drops and larger slabs would leave fewer very small pieces of concrete to be later picked up by hand. The small pieces had to be picked up to avoid damaging the pulverizer. The rock rake was used for 35 working hours on this job, which gave an average of better than 100 lin. ft. of 4-lane paving ripped up and piled per hour.

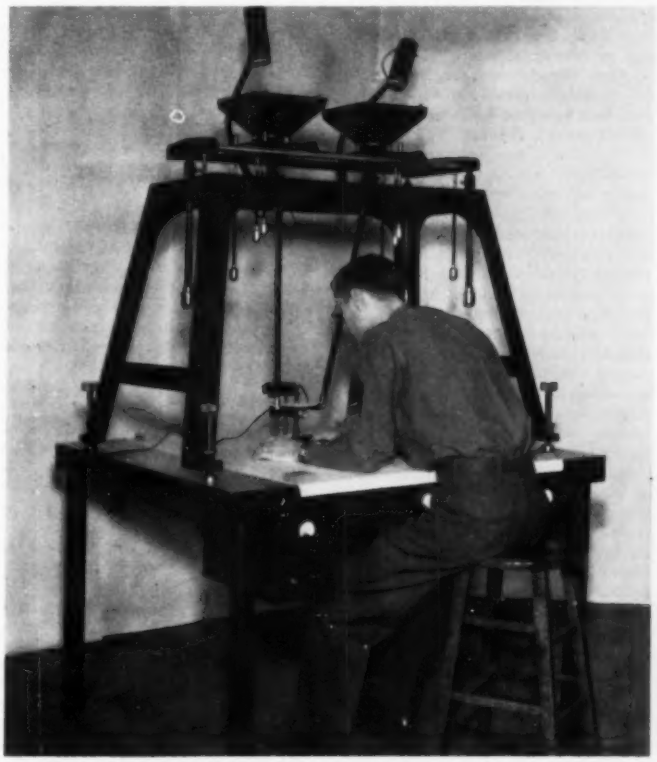
New Air Mapping Equipment Developed

The Kelsh Plotter, a relatively new stereo-photogrammetric mapping instrument, has been tested and evaluated for military application at the Engineer Research and Development Laboratories, Fort Belvoir, Virginia.

The instrument was originally designed by Harry Kelsh who was then with the Soil Conservation Service. It was further developed by the Geological Survey for use in its mapping program.

The Kelsh Plotter, in principal, is similar to the Multiplex, a standard stereo-photogrammetric mapping instrument of the Corps of Engineers. Both instruments project a three-dimensional, measurable image from a stereo-pair of aerial photographs, from which a topographic map may be drawn. The Multiplex requires auxiliary equipment to correct for aerial camera lens distortion present in the aerial photograph, whereas the Kelsh Plotter has a correction device built into the instrument. Moreover, the three-dimensional image projected by the Kelsh Plotter is more highly resolved and at a greater magnification than that projected by the Multiplex.

The commercial model tested by the Topographic Engineering Department at ERDL, although lacking certain desirable features, revealed a basic design favorable to military mapping applications. Accordingly, modification and further development of the instrument is being actively pursued.



★ The Kelsh Plotter developed for stereo-photogrammetric work

NAVY HOLDS SEMINAR ON

Jet Airfield Pavements

More intensive research in pavement design for jet planes is needed for both bituminous and portland cement concrete types, note these speakers, who also plead for better cooperation between flight and ground officials and pavement designing agencies

Special to Roads and Streets

MAJOR CHANGES in concepts are being faced by designers of pavements on airfields used by jet airplanes.

Such was the realization of the 450 delegates attending a symposium on airfield pavements for jet aircraft, held at the U.S. Naval civil engineering research and evaluation laboratory in Port Hueneme, California April 17 and 18. Speakers from the Navy, the Air Force, the Corps of Engineers—even from the British Air Ministry and private industrial concerns here in the USA—agreed on one basic point: it calls for better engineering and more research to build a modern airfield for jet aircraft.

Until 1949, pavement design for military aircraft was still based primarily on wheel loads, with low tire pressures. Suddenly designers were told to expect loads up to 50,000 lb. per wheel, with tire pressures up to 250 psi. That wasn't too difficult, provided new fields could be built. Usually they couldn't; in many cases old fields must be "beefed up" to take jet aircraft. Engineers could see all too plainly the coming problems of increased sheer stress, heavier loads on sub-bases, and the research it would take to evaluate the characteristics of aircraft then unknown.

"Old concepts regarding the strength of base courses had to be junked and new ones conceived," said L. A. Palmer, head of the soil mechanics and paving section, Bureau of Yards and Docks, U.S. Navy, from Washington, D.C. "Jet aircraft introduced problems wholly new: terrific air blasts, intense heat, new problems in fuel spillage, high shear action when the heavy streamlined planes landed. These things are not at all unusual; they're real problems we're trying our best to whip," Palmer said.

Palmer pointedly covered many points of concern voiced by other speakers. Jet-blast damage to bituminous pavements he called "usual". Expansion and contraction joint material melted and blasted out of rigid portland-cement pavements is common, he said. The effects of jet blasts on pavements saturated with frost or covered by water have largely gone unexplored, and not enough experiments have been made with heat-resisting pavements, Palmer explained, although he said average temperatures 3 in. below the surface of a test pavement at Patuxet, Md., had been reduced from 141 to 97 deg. F. by constructing the jet runup slab with high alumina cement.

Jet-Aircraft Effects

A detailed account of the effects of jet aircraft on pavements was given by Commander J. C. Luppens, head of the Public Works Shore Establishments Division of the Navy's Bureau of Aeronautics. Luppens, who is a Civil Engineer Corps officer on duty with BuAir, recently correlated much test information on navy aircraft relating to jet-blast temperatures and velocities, tire pressures, probable landing patterns, and such.

Present navy jet aircraft studied by Luppens have tail pipes which set angled toward the pavement (or aircraft carrier deck) at approximately 12 degrees. With the jet engine at idling speed, a blast of gas at 409-degree F. roars out at about 700 fps. At military power, the velocity increases to 1,350 fps and the temperature jumps to 772 deg. F. When the pilot cuts in his afterburner, 1,800-deg. temperatures with 1,830-fps velocities at the tailpipe are common. While minor increases in temperature and velocity can be expected, according to Luppens, the navy expert believes future increases in jet-engine power will be made with bigger engine openings.

★ Commander F. C. Tyrrell, CEC, USN, Officer in Charge of the Navy's civil engineering and research laboratory at Port Hueneme, California—welcoming delegates to the jet airfield pavement symposium

Luppens told in vivid language the power behind a jet engine blast. On one navy field, a jet engine blast tore loose a well-anchored steel Marston runway matting, sailed it through the air, and left it rolled end over end. Asphaltic concrete was badly scored when jet pilots parked on that material for long runup checks of their engines. The elliptical, hellish pattern of jet damage from 20 to 50 ft. behind a jet's tailpipe is becoming more and more a headache to the engineering designer who plans the pavements, he explained.

Heavy Touchdowns

Touchdown loads up to 173,000 lb. can be expected in some cases with today's Navy aircraft, said Luppens. Reversing the theory held in many places, he said his office was in accord with recent experiments by the Corps of Engineers which indicate that a dead plane produces the heaviest load on any part of the airfield pavement. Even a towed plane picks up enough wing lift to make the wheel load lighter than a parked dead ship. A plane with its engine idling—and here he was speaking of propeller-driven craft—builds up enough wing lift to overcome the added wheel load generated by vibration from the reciprocating motion of the engine.

Navy planes usually touch down hard, and for a good reason, said Luppens.

"As you know, Navy air is designed around the airplane carrier," he ex-

plained. "The carrier, with its mobility, fits in with the mobile nature of the Navy itself. But carrier decks are much shorter than conventional shore fields, and when a signal officer gives the 'cut' command the pilot drops 17 fps or over, and hits with a bang. Naturally, the landing load increases much faster than the sinking speed and you've got a shear problem which holds true on that type of landing on a shore field."

Pilot's landing reactions are very important to pavement design, said Luppens, as he detailed some results he had gathered from observations of pilot behavior. Put a big white pad at the end of the runway where a plane lands and the pilot will almost always try to hit that spot when his wheels touch down. But they'll land "long", taking no chances, if the landing end of the runway is near water or other such dangerous obstructions. They'll do the same thing, if they can, on a carrier deck. But put a fence or other barrier at the opposite end of a runway, and no matter how long it is, pilots will usually land "short". There seems to be an instinctive attempt for safety.

Luppens told how landing problems had been sharpened by smaller tires, high pressures, and stiffer shock absorbers in landing gear. It is not at all unusual to find tire pressures up to 260 lb. now on navy planes, with 320 contemplated. How advance bases can be constructed to take such pressures is a serious problem, he said. Many U.S. airbases operated by the Navy now have 50,000 landings a year and over.

Jet airfield problems, Luppens summarized, are, in order of their importance: (1) Afterburner heat damage, (2) Proper pavement joint treatment, (3) dust control, (4) scuffing of pavements on landing, (5) fuel spillage, and (6) erosion control at ends of runways.

Air Force Contributes

Added definitions to the problem were spelled out by Lieutenant Colonel Gayle Smith, Deputy Director of the U.S. Air Force's Development Programming, from Washington, D.C. Colonel Smith prefaced his remarks with the statement that Air Force temperature and velocity studies corresponded generally with those made by Commander Luppens' division in the Navy.

But Smith pointed out that blast heat dissipates rapidly, and that the engineers need the cooperation of pilots. By building special runup pads at runway ends, and developing better joint material on the parking aprons, Smith believed the problem might be lessened if not actually solved. To illustrate his point regarding heat dissipation, he told how 1400-deg. temperatures at the tailpipe of an F-86 dropped to 200 deg. 50 ft. back from the plane. A jet airplane will usually do negligible damage or none at all if it is moving. He emphasizes the urgency for a cooperative approach between pavement engineers and aircraft pilots, so that runups would be made in areas built to stand the blasts.

The USAF currently operates planes grossing as much as 400,000 lb., Smith said, but multiple landing wheels arranged in tricycle or bicycle patterns often make individual tire pressures less on the big planes than on a sleek 16,000-lb. fighter. The Air Force is trying to hold tire pressures down to 200 psi, he said.

Operational characteristics for various aircraft vary greatly with elevation, and a runway 10,000 ft. long at sea level with an ambient air temperature would have to be 14,000 ft. long at Elev. 3000 on a summer day with 90-deg. air temperature, said Smith, and runway length has definite bearing on design.

The Air Force too has had blast damage on its pavements from jets, but restriction of runup checks to concrete areas is minimizing the erosion to some extent. Fuel spillage was a bad problem, especially in the early days when jets burned a kerosene-like fuel with a low evaporation factor. Modern jet fuels such as JP-3 and JP-4 evaporate much faster and there is less danger of asphaltic cement dissolving. Smith explained that a careful disciplinary program among the fueling attendants, coupled with good maintenance of hose connections and nozzles, will do much to eliminate fuel spillage. Invariably when fuel is spilled it is done during the ground operation rather than by the pilot.

Looking to the future, Smith said the U.S. Air Force expects cargo planes to remain about the same weight. Fighters probably will get heavier, and bombers will get lighter, including those in the Strategic Air Command.

Rocket Effect

One of the most destructive forces which man can turn loose on an air-

Better Liaison on Jet Airfields?

An Editorial

If speakers' statements made at the recent Navy symposium on jet airfield pavements represent the problem accurately, better understanding is certainly needed between airport designers and operational personnel including jet pilots and ground crews.

Speaker after speaker told in detail how pavement is damaged by hot exhaust gas leaving tailpipes of jet aircraft at speeds approaching Mach 1, the velocity of sound. For 50 feet or so behind the ship, asphaltic concrete pavements raveled, eroded and burned. The joint material in rigid-type portland cement slabs melted and blew away in a sticky mess, to become a nuisance and danger to delicate landing gear later on. Erosions often 2 inches deep were noted, especially on fields where pilots and mechanics were permitted to run up the jet engines over vulnerable pavements. Every man agreed, and there wasn't a single dissent, that these operational characteristics are typical for contemporary jet terminals.

But several speakers told how damage had been reduced or eliminated by building heat-resistant concrete pads in the critical areas, and then enlisting the pilot's cooperation to use these special areas for full power runup and afterburner cut-in operations. When this was done at the San Diego Naval Air Station, pavement damage was materially reduced.

Fuel spillage, caused all too often by careless ground crews, has been cut to a bare minimum on every station where ground crew chiefs were energetic enough to give the work competent supervision. Careful attention to fuel tank levels, coupled with the prompt repair of leaky nozzle and hose connections, will save a pavement maintenance crew many a headache. And possibly a bad fire or even a plane crash can be prevented.

It seems only a matter of common sense to conclude that it is incumbent on airfield design agencies to explain the problem to the flight and ground people. An articulate presentation of the problem, combined with common friendliness and understanding, would do much on every jet airfield to solve the present problems of pavement failures and excessive maintenance.

★ From England to attend the conference—Group Captain Roy Fayville of the British Royal Air Force

★ Foreign engineers attending the Port Hueneme conference included Greece's Aeronautical Engineer Charles Merlin, of Athens, who directs his country's airport program. He is being shown data on wheel load research by J. C. Nacos, a U. S. civilian from the California Institute of Technology

field pavement is the blast of a modern rocket. So said F. M. Mellinger, Director of the Ohio River Division Laboratories of the Cincinnati office of the Corps of Engineers, as he told how a 4000-lb. thrust rocket generates a blast of 2300-deg. (F) heat 18 ft. back from the plane.

Mellinger's office has utilized Linde Air Products' new jet blow pipe—being used in burning powder holes for Mesabi Range ore drilling—to simulate on a small scale typical aeronautical rockets. According to Mellinger, the Linde burner flame is about 1/6 the size of the average RATO or JATO unit. Various aggregates have been subjected for 15 and 30 seconds to 500, 1100 and 1900-deg. temperatures to check their reactions to sudden thermal shocks. Ceramic materials, non-glassy slag, lightweight Lelite and hematite traprock aggregates were rated "very good". Granodiorite and marble aggregates from North Carolina were "good". A blue marble-cliff limestone from Ohio was one of the poorest aggregates tested, but Mellinger explained that only about 8 varieties of limestone had been checked.

One of the worst pavement damages caused by rocket assists on the ground is the nitric acid residue left behind. For that reason, he said, it is fortunate for engineering designers that rocket assist units are designed principally for use when the aircraft is off the pavement. If rocket assist units ever are generally used, the flame length and angle of mounting will have to be studied much more closely by aircraft designers, said Mellinger. His office is also doing considerable research on heat-resisting pavement mixes. For use as binding agents he has tried lumnite cement, a mixture of 75-25 portland and natural cement, portland cement alone, and a mixture of portland cement and pozzulan.

The Navy, too, had near-solutions to describe. According to J. A. Bishop, Director of the Port Hueneme Soils and Pavement Division, said that the research evaluation laboratory has established realistic test conditions complete even to an Allison J-35 A4 engine. San Gabriel River aggregate with Type II portland cement are being used for some of the test slabs, while Rocklite and pumice aggregate slabs are also showing promise in the tests. Bishop said that sealcoats and asphaltic concrete slabs were also undergoing tests behind the special jet engine carriage which permits the angle of impingement to be varied from 0-15 degrees.

A panel discussion on the modernization of existing airfield pavements produced information which largely duplicated that given by the other speakers. The panel of experts seemed to agree, however, that certain critical areas of jet terminals should be paved with portland cement concrete or possibly even some of the more heat resistant materials. They agreed that the higher initial cost would likely pay for itself in less maintenance during operation. Slabs with no expansion joints and sawed contraction joints were mentioned as possible solutions.

Material Experts Speak

Verification of the problem and its solutions was given as A. A. Anderson, Manager of the Highways and Municipal Bureau, Portland Cement Association, told delegates that jet aircraft definitely are subjecting pavements to completely new loading and exposure criteria. Anderson warned that much more money is tied up in aircraft than in the fields which accommodate these ships, and he added that engineers must recognize that pavements must be built to fit aircraft. Too often, he said, it is the other way around.

Anderson then brought in major problems which engineers had been discussing, with these comments:

High Pressure Tires: "Solid rubber tires won't damage a portland cement concrete pavement, and until pressures get to 600 psi, solid rubber won't be approximated. Pressures are from 200 to 240 psi at the present time. Naturally you have a problem of smaller contact area and high pressure with today's small tire, but that problem can be whipped by designing slightly thicker slabs. PCA has criteria—well tested and proved—available for the designer's use."

Fuel Spillage: "Portland cement concrete is not affected, so far as we know, by fuel spillage. However, the joint material is, and we should face that fact. Fortunately, several types of jet-fuel-resistant joint material has now been introduced, and we at PCA believe the pavement will stand up satisfactorily if the joints are thoroughly cleaned before the material is applied. And why do joints have to be filled full? Why not pour to a quarter inch below the slab surface to minimize blast effect?"

Heat and Blast: "Again, portland cement concrete isn't particularly affected by this factor, but joints are; particularly longitudinal joints. I strongly recommend underfilling by ¼-in. in critical areas. The need for expansion joints can be reduced by shorter-interval contraction joints, and these can be sawed, filled with cement-asbestos material, or possibly a JFR material with a cover coat. Special concrete may be needed; we may be approaching the day when aggregates will have to be selected carefully for the upper part of the slab."

To prove that portland cement con-

(*Continued on page* 120)

California's Epic Storm Battle

How veteran snow fighting crews fought a once-in-a-lifetime blizzard in the Sierras, using standard methods and equipment, aided by such special procedures as blasting, hand sawing of snow banks, tractor drawn cable loops, and special cutting blades on motor graders.

By G. F. Hellesoe

Maintenance Engineer, California Division of Highways, Sacramento

THE blizzard which isolated the Donner Summit region of California in January received much national publicity, principally due to the blockading of a transcontinental Southern Pacific streamliner. However, I doubt if anyone can ever fully picture the courage and endurance shown by our highway maintenance crews during this emergency. At the invitation of ROADS AND STREETS I will try to summarize some of the events, experiences and methods covering some part of the snow battle, for the benefit of highway maintenance men in other states who have severe winter problems.

As this is written, in Mid-March, California highway engineers are still busy with many of the operational details resulting from the storm. No small part of the job recently has been our cooperation with the local press and radio stations, to give day-by-day accounts of the more dramatic phases of the snow clearance. Much of our information is still of the word-of-mouth variety, and it may be several months before final statistical details are available and a report is written for record purposes.

These notes augment the excellent article by N. R. Bangert, Assistant Maintenance engineer, published in California Highways and Public Works, January-February, 1952.

Inasmuch as the operations on and in the vicinity of US 40, the Donner

★ Snow "canyons" remaining after the big storm required many days to widen with auger type plows

★ All-wheel drive motor graders, equipped with special snow cutting blade mounted on raised mold board, took part in the Donner Summit battle

★ Hand sewing of drifts in progress as described in accompanying article

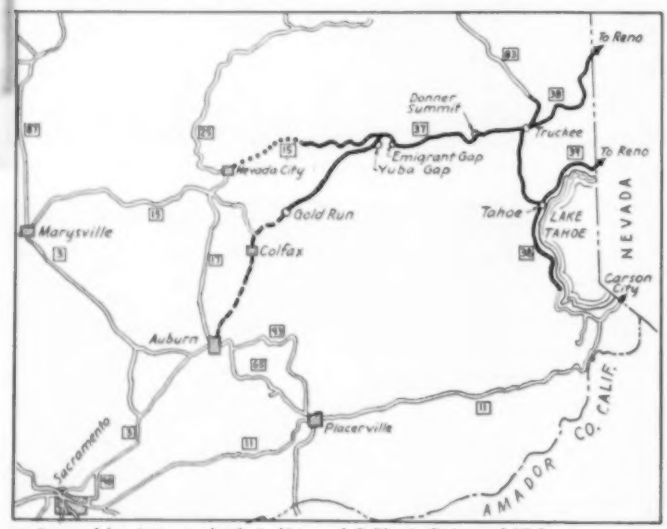
Summit road, are more or less typical of operations for the entire mountain area affected by this exceptional storm, we will endeavor to confine the following account to this area.

Busy Ski Area

U. S. 40 over Donner Summit is maintained as an open road during the winter months. This route carries the major portion of interstate truck traffic easterly from the San Francisco and Sacramento areas. The mountain area bordering some 22 miles of this route west of the summit is a popular snow sports center. Traffic volume fluctuates greatly, being at a peak on week-ends favorable to skiing. The winter traffic check station just west of Truckee reflects more closely the through traffic volume on this route. The average total traffic volume for the five winter months, November through March, is about 1800 vehicles per 24 hours, including about 400 trucks.

The average maximum annual snow pack for a 50-year period at Donner Summit (Norden) is about 150 in. The average total annual snowfall for this period is about 380 in. A few exceptional years with relation to snow pack have been experienced, such as the winter of 1910-11 when 308 in. was recorded, and the winter of 1937-38 with 190 in. Snow pack depths for the past winter totaled as follows:

December 25, 1951	57 in.
January 1, 1952	121 in.
January 10, 1952	118 in.
January 17, 1952	218 in.



★ Scene of heaviest snow battle in history of California Division of Highways

776 Inches—Wow!

On March 20 the snow pack at Donner Summit, California, had reached 314 in.—greatest since accurate records began to be kept in 1897, according to G. F. Hellesoe, maintenance engineer. On March 20 the total snowfall for the winter had reached 776 in., equaling the 1889-90 depth and approaching the all-time-record of 783 in. for the 1879-80 winter. Probably by the time this article appears a new all-time record will have been set.

Years of exceptionally heavy total snowfall were 1906-07 with about 600 in., 1910-11 with 564 in., and 1937-38 with 596 in.

Snow removal operations supervised by Maintenance Superintendent T. T. Buell at Truckee include a 63-mile stretch of US 40 between Gold Run and the Nevada state line. An open road is also normally maintained south from Truckee to Tahoe City, a distance of 14 miles, and from that point stub connections radiate south and east 16 miles and 11 miles respectively. Snow is also cleared on the 7-mile stretch between Truckee and Hobart Mills. The road connecting Nevada City with US 40 (Route 15 on map) is maintained by Superintendent Buell's organization as far west as Washington Road, a distance of 14 miles, and is generally reopened when equipment can be released from the main line. Superintendent Buell's territory in the immediate vicinity of US 40 is shown by solid black lines on the accompanying map. Crews from other territories maintain the adjoining portions shown in broken or dotted lines. Maintenance stations within the Truckee territory are maintained at Yuba Gap, Donner Summit, Truckee and Tahoe City ("Tahoe" on map).

Following is a list of the important landmarks along US 40 between Auburn and the Nevada State Line and a mileage log from Auburn and elevations:

	Mile	Elevation
Auburn	0.0	1255
Colfax	17.5	2418
Gold Run	26.4	3225
Baxters	32.4	3800
Emigrant Gap	41.0	5225
Yuba Gap	44.0	5764
Cisco Grove	49.0	5643
Soda Springs	58.4	6768
Donner Summit	61.4	7135
Foot Donner Grade (at Donner Lake)	64.8	5935
Truckee	70.7	5820
Nevada State Line	89.9	5126

On-the-Scene Radio Broadcast Describes Big Storm

(Tony Koester, radio announcer, and Johnny Lloyd, snow plow foreman—Donner Summit, California, Feb. 6, 1952)

Koester: Now, let's go back to the day this all began—that was a long time ago, wasn't it Johnny.

Lloyd: Well, it was around the 11th of January when it first started to get a little bit tough.

Koester: And you got snowed in—was that on the 11th?

Lloyd: No, that was the 13th, on Monday the 13th. (Monday was the 14th).

Koester: Will you tell us about that, Johnny.

Lloyd: I got up in the morning about 4:00 o'clock and took a drive down the road. Things didn't look very bad to me; the wind was starting to blow and the road was a little narrow, but I didn't become concerned about it. I went down to Cisco Grove and ran into a little slide, and couldn't go any further. I came back to Cisco. A Snogo was working there. I directed him to clear that slide out so we could run the plows up and down.

Then they were having a bad time down at Yuba Gap, so I went back half an hour later and told the Snogo operator he had better cut on down to Yuba Gap, get a new tankful of gas, and then cut on back up here up towards the summit. I still didn't see anything wrong out of the ordinary.

Lloyd, (continuing): When I got back up to—let's see, I had another rotary working just east of Crampton's heading west when I got back up to Kiski Lodge, three quarters of a mile west of the Donner Summit, here was one of the big graders stuck in a drift. The graderman had gone through to Soda Springs, and then come back to Kiski Lodge. The snow was already 2 ft. deep or more in the middle of the road, and he couldn't get through it. It blew in so bad behind him he couldn't back up and go the other way. So there he sat.

We had one rotary in the barn for a service job. As I saw the road was impassable I radioed in for that rotary to come and cut a road down to us. The operator got it out as quick as he could, and it was possibly 6:00 o'clock then. He got half way from the camp to where we were stranded. The wind was blowing so hard that it just covered up his engine with snow. Fine snow blew in through the sides of the hood—the rotary drowned out—the engine quit dead.

The stalled operator walked back to the summit and called me by radio. We then took two trucks, FWD's, out to try to tow that rotary home, but it blew in so fast and the snow was so deep that they couldn't even get out there with the four-wheel drive trucks—very powerful trucks. They couldn't even get out to that rotary that was dead. The only thing they could do was to get another rotary, cut a road to the summit, tow the stalled one into the barn, and dry it out.

Lloyd, (continuing): The mechanics were powerless to do anything out there— if they raised up the side of the hood, the engine would have been completely covered with snow. Then they called up a rotary from the Crampton area—the operator didn't have a radio in that machine so we got one of our friends down there to watch for it. When it came along, this Glen Parsons from Trailside, he stopped him and told them we were in a bad way up here so he turned around and started up this way. I wanted him to get up here as fast as possible. He was able to make fairly good speed until he got to Kingvale but from Kingvale up, the snow was anywhere from 18 in. to 3 and 4 ft. deep.

Consequently, it was getting dark when he cut his way up to Kiski Lodge. We felt good though—those rotaries sound nice when they're coming along. We had been waiting all day for one, so we started to cut on into camp. We had the pick-up dug out, the grader was running, and we were following along behind in the rotary. I hadn't had anything to eat that day at all. Some of the other boys had been working since midnight, and here it was way after dark again and they still were working.

So got about 200 ft. west of the rotary that had been stalled all day—the going was very tough with drifts 7, 8 and 9 ft. high we were bucking through; but the poor old Snogo she had just taken too much that day and the front differential finally went out and there we were. There were six of us—Herbert Costa, myself, Weslie Barnhart, blade-man, George Graham, rotary operator, Howard Ronningen—push plow operator, and Donald Davis—rotary swamper. We were stuck then. We had to walk to camp. The wind was severe, about as severe as I have ever seen. We all stayed together pretty well and we'd have to stop often for snow markers to guide us. Sometimes it was impossible to see a thing—you just had to stand and wait until the wind would die down for a second, then we could get our bearings and go on.

We got into camp in good shape—everybody was cold and miserable and that old highway barn at Donner Summit looked good when we came struggling in.

As previously mentioned, Tahoe City at an elevation of 6140 ft. is 14 miles south of US 40.

Normal Plowing Procedure

The major pieces of snow equipment normally assigned to each station and the mileage of snow road normally maintained from each station are as follows:

	Auger Plows	Push Plows	Motor Graders	Sanders	Loaders	Expresses
Yuba Gap 35.6 mi.	2	4	1	1	1	2
Donner Summit 16.8 mi.	3	4	1	1		1
Truckee 41.4 mi.		4	1	1	1	1
Tahoe City 34.8 mi.	1	1				1

The above list does not include mechanics' trucks, rock plows, routine maintenance and transportation vehicles. During the winter months these stations are manned by some 86 men, including foremen, timekeepers, equipment operators, laborers, firemen and cooks. Dormitories and cook houses are maintained at Yuba Gap and Donner Summit. Short-wave radios installed in the foremen's express trucks and at the maintenance stations permit ready communication between the field and the office.

Under normal operating conditions, large push or displacement type plows are put on the road as soon as snow begins to fall. Snow is pushed to the side as rapidly as possible, and if there is a tendency for the snow to stick to the pavement, motor graders are put into operation to prevent the formation of an ice pack, which can develop very rapidly at times under the action of heavy truck traffic.

Normally, as soon as 1½ to 2 ft. of snow reef has been accumulated at the roadside and especially after the season has advanced to the extent that a sizeable snow wall has developed on the roadside, auger-type rotary plows are put into operation to clear the road prism. Plowing is normally continued until the storm is over and the road has been cleared and widened to the snow stakes. Scraping with motor graders may

★ Digging out a push plow buried during the January blizzard on U S 40

★ This 4,000-ton boulder slid down and blocked U S 50 on February 2, 1952

★ Three "Cat" D8 Tractors teamed up January 19 to pull the "City of San Francisco" locomotive power units loose from the grip of snow and ice.

continue for several days after a storm, depending on temperature or other weather factors. Any pack which is allowed to remain on the road for any considerable time after a storm is sanded with crushed rock screenings. Under certain conditions to hasten the melting of isolated areas of pack, half ground kiln dried salt (sodium chloride) is spread from special dispensers attached to light express type trucks.

Barring heavy winds and drifting, heavy falls of snow can be handled by the equipment assigned along US 40 and in the Lake Tahoe area. Generally, if closures occur they are caused by sudden blizzards of relatively short duration, by small snow slides which are more or less common on the eastern slopes of the range, or by traffic tie-ups frequently resulting from the jackknifing of a heavy truck and trailer unit. Under such conditions, traffic is barred from the high mountain areas by means of manually operated gates at Baxters and Donner Lake. These gate stations also serve as chain control points during the heavier storms; however, as conditions dictate, the chain control points are moved to other selected locations where extra pavement width is provided for the parking of vehicles while installing chains.

Foreman Describes Storm

The storm starting January 10 was exceptional in that wind velocities were very high and visibility was reduced to zero over many miles of the high mountain roads. Lack of visibility and reoccurring slides on the grade east of Donner Summit necessitated the closing of US 40 on the afternoon of January 11. Winds raging at an estimated 75 to 100 mph. built up deep drifts faster than equipment could cut them out. Particularly severe drifting was experienced on several miles of ridge located near Airport, some 6 miles west of Yuba Gap, and in the vicinity of Donner Summit. Some idea of how things went as the storm progressed is given in the accompanying transcript of a portion of an on-the-spot interview made by the McClatchy Broadcasting Company and broadcast over their radio station KFBK on February 6, 1952. The participants are Tony Koester, Radio Announcer, and Johnny Lloyd, Foreman at Donner Summit.

As soon as the wind subsided, Foreman Lloyd was able to get his stalled equipment started, and work was concentrated on establishing a service road between Donner Summit and the Yuba Gap area. The service road was punched through by January 18. As soon as supplies and replacement units could be brought in over this service road, efforts were directed toward the opening of a road through the deep

(*Continued on page* 119)

★ By Jan. 17, 1952, this motor grader had worked steadily for 18 days keeping roads open through four towns in the Sierras—Monte Vista, Dutch Flat, Alta and Baxter. Cleanup job followed a rotary. Grader owned by Placer County District 4, California

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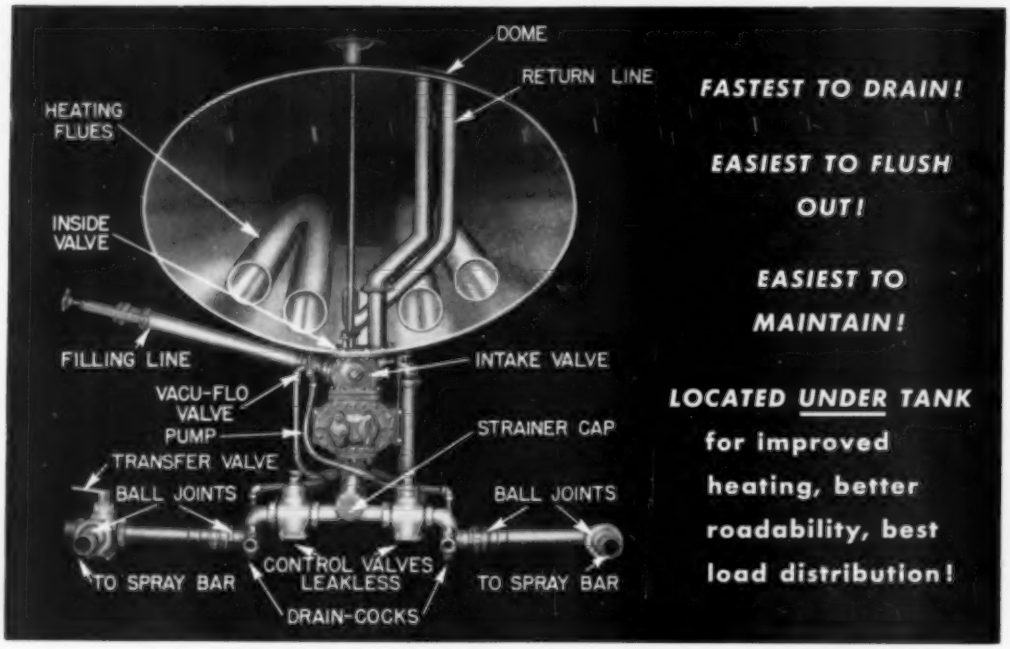

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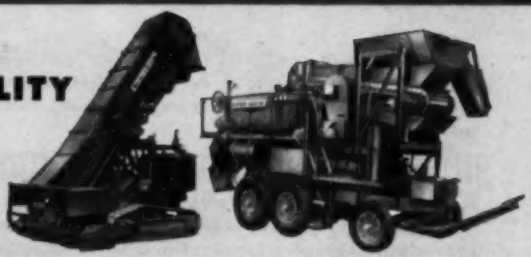

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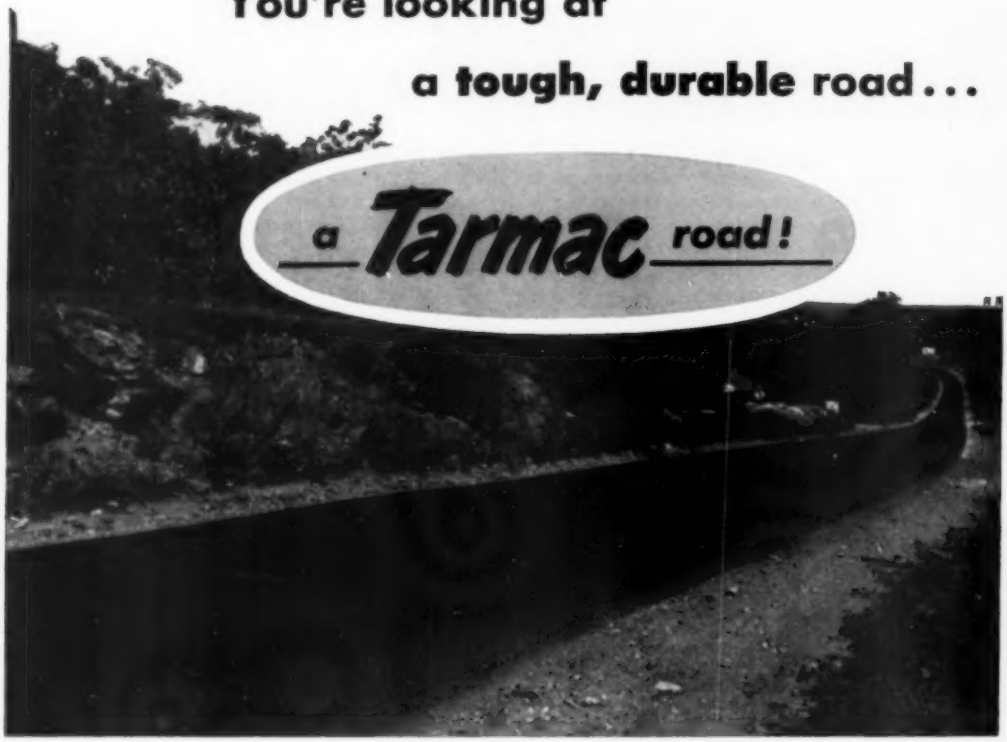

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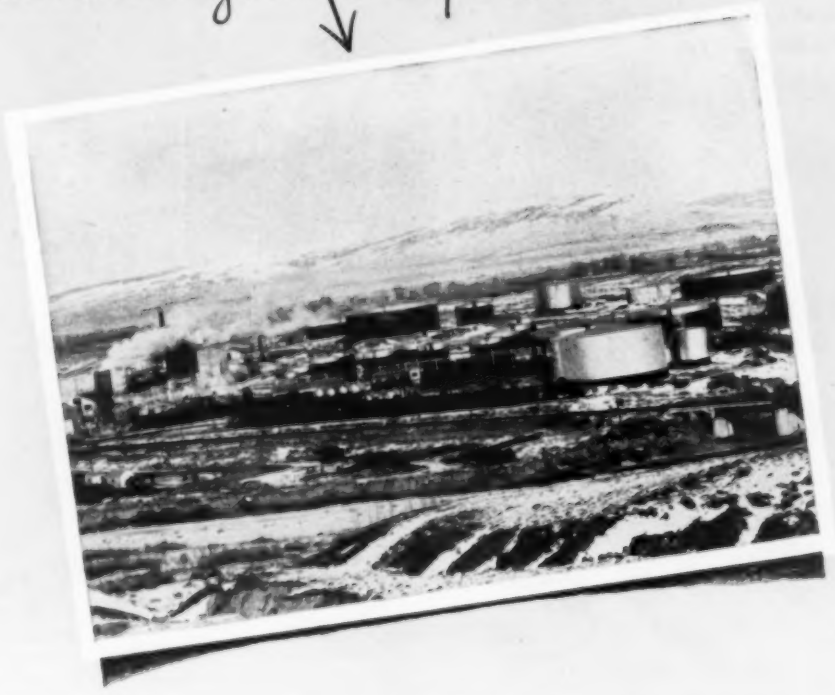

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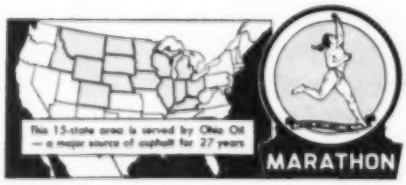

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By K. M. Wallace

County Engineer, Lyon County, Rock Rapids, Iowa

LYON County is located in the extreme northwest corner of Iowa. It covers an area of 576 square miles and has a population of approximately 15,000. The secondary road system includes 148 miles of county trunk roads and 904 miles of local county roads or a total of 1052 miles of which 913 miles are gravel surfaced and 23.4 miles are bituminous surfaced. All farmsteads in the county have surfaced outlets.

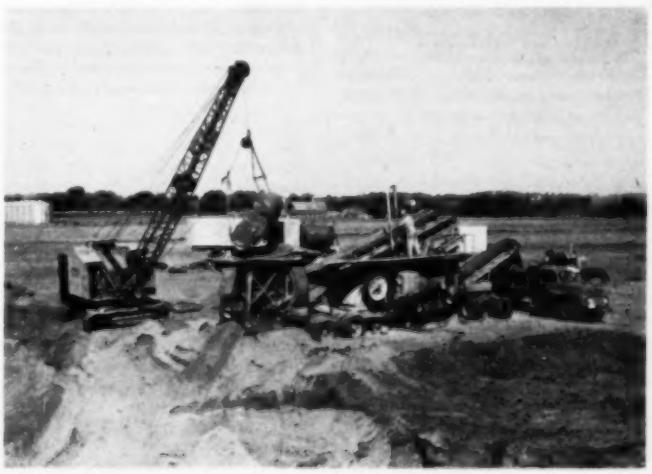
The State Highway Commission was contacted for recommendations of bituminous construction that would cost approximately $12,000 per mile. They recommended either a 5-in. cold laid bituminous base with a single course surface, or a 6-in. stabilized base with a ¾-in. bituminous wearing surface. The Board favored the 5-in. cold laid base type built.

Roads to be improved were confined to routes which either connected two towns together or connected a town to a paved primary road.

County owned pits located at Rock Rapids, Klondike, and Doon were selected to furnish the material, and 100-lb. typical samples from each pit were sent to the Highway Commission Laboratory at Ames to be used for designing the mix. From these samples the laboratory determined that the pit at Rock Rapids would be suitable for 7.5 miles of base course located an average of 8 miles from the pit. The laboratory recommended that 80 percent of the Doon aggregate be mixed with 20 percent of the Klondike aggregate for the remainder of the projects. The average haul from Doon was 7 miles and from Klondike 17.5 miles.

As soon as the ground thawed down 6 inches we started taking samples of the roadbed for different types of soil along each project. The samples were sent to the highway commission laboratory. They were used to determine what the Proctor Density of the soil in the roadbed should be at optimum water content.

Abstract from a paper presented at the Fifth Annual County Engineers' Conference held at Iowa State College, Ames, Iowa, on December 5-7, 1951.



★ Producing base materials from one of the county-owned pits

★ Cold laid bituminous concrete base, placed with a travel plant under close inspection control, is this county's method for stretching road funds

Due to the size of the projects, competition was good. The successful total bid of Cameron, Joyce & Company was $310,734.92 for the project totaling 23.3 miles, as follows:

Single Course Bituminous Surface Treatment	
1. Roadway cover aggregate, @ $2.50	75,993 Tons
2. MC-4 binder bitumen, @ $0.14	3,743 Gal.
Total cost of surface treatment	$19,996.52
Average cost of surface treatment, per mile	855.32
Asphaltic Concrete Base Course	
3. Asphaltic concrete, @ $3.12	82,516 Tons
4. MC-0 primer bitumen, @ $0.13	70,146 Gal.
5. Additional or less bitumen, @ $0.10	Gal.
Total cost of base course	$279,048.90
Average cost of base course, per mile	11,935.88
Preparation of Subgrade	
6. Preparation of subgrade, @ $500.00	23.379 Miles
Total cost of subgrade preparation	$ 11,689.50
Average cost of subgrade preparation, per mile	500.00
Grand Total	$310,734.92
Average Total Cost, Per Mile	13,291.20

Due to the large amount of money accumulated in the State Farm-to-Market Fund, the highway commission agreed to finance these projects even though we were considerably over our $240,000 surplus.

Good Inspection Required

Providing inspection for the projects proved to be a major problem. The Highway Commission did not award the contracts for several weeks after the letting, pending the assurance of adequate inspection. Efforts were made to procure one man familiar with this type of work from the highway commission at Ames, at Iowa State College or at consulting engineering firms in Des Moines, Ames, Davenport, Minneapolis and Omaha.

Finally, the district engineer at the Sioux City office of the Highway Commission agreed to lend us an engineer from his branch office as Inspector-in-Charge. Also, we finally were able to hire two undergraduates, a civil and a general engineering student, who spent two weeks in the laboratory at Ames learning the various steps in inspection. In addition to these three men, from 5 to 7 assistants were supplied from local sources. And, when hauling from the Doon and Klondike pits at the same time, an extra gravel checker and scaleman were required. Our regular layout party was used during the preliminary sampling and for staking the projects.

The testing equipment necessary for the work was lent to Lyon County by the Highway Commission laboratory. All adjustments necessary for the calibration and standardization of the equipment were made before it was shipped from Ames. The contractor was required to furnish a 7x10 ft. field laboratory and keep it supplied with water for testing purposes and with 2000 w. of electricity. In addition, the contractor supplied a scale house and a shed for the pit checker.

★ Illustrating Step 6—see article

Construction Procedure

The asphaltic concrete cold laid base was built in two layers, each 2½ in. in thickness, with a crown of 4 in. The top width of the asphaltic base is 22 ft. plus a 1-ft. taper on each side from the full 5-in. thickness to zero at the outer edge.

On approaches to bridges, the subgrade was undercut to a depth of 5 in. at the end of the bridge, tapering to zero at a distance of 150 ft. from the bridge.

Change orders were approved for

★ Typical section of the finished road, which required some shoulder widening to encourage local motorists to use the full paved width

each project to provide asphaltic base material at $4.00 per ton to build tapered approach strips 2 ft. wide across each driveway, 6 ft. wide across each side road, and to widen the intersections of our roads with paving. Work progressed slowly during the early part of the summer, due to unusually wet weather. Oil shipments were also delayed by strikes. A total of 2½ mi. remained to be completed at the end of the season, but in an ordinary year the 23.4 miles would have been completed easily.

Construction Steps

In order to provide for adequate inspection and control, the construction work on these projects was performed in steps as follows:

Step 1.—The upper 6 in. of the subgrade was scarified, mixed, sprinkled and rolled with rubber-tired and sheepsfoot rollers until a minimum of 95 percent of Proctor Density was reached. Inspection of this step was made by the subgrade inspector and his assistant.

Step 2.—A prime coat of MC-O asphalt was applied at the rate of 0.20 gal. per sq. yd. Inspection by the Laboratory Inspector.

Step 3.—Gravel was hauled on the primed subgrade for 2½ in. of the mat. The gravel was spread with a blade and farmed with spring-toothed harrows until the moisture reached 1½ percent, then was bladed into a windrow and evened with a template. Inspection by the Gravel Checker, Scaleman and Pit Checker.

Step 4.—Alden limestone dust, pulverized to a minimum of 80 percent passing the 200-mesh sieve, in 100 lb. sacks, was deposited along the gravel windrow at the intervals necessary to meet the specifications. Inspection by the Assistant Laboratory Inspector.

Materials Used

For some of work	
1-in. pit-run gravel, from Rock Rapids pit	91.68%
#80 limestone dust	3.82%
MC-4 binder bitumen	4.50%
For other jobs	
1-in. pit-run gravel, from Doon pit	74.11%
1-in. pit-run gravel, from Klondike pit	18.53%
#80 limestone bitumen	4.50%
MC-4 binder bitumen	4.50%

Step 5.—After each mixing-run 50-lb. samples of the asphaltic base mixture were taken and sent to the commission laboratory at Ames, for test. These tests showed that the above mixtures had a Hveen Stability of 79 and 80 psi. side pressure when tested at a vertical load of 400 psi. Hubbard-Field Stability tests on 6-in. specimens showed a total compressive load of 1800 lb. on the mixture using pit-run gravel from the Rock Rapids pit. The specific gravity of the compacted specimens, by displacement, varied from 2.19 to 2.25. All specimens were cured for approximately 20 hours after molding before the tests were performed. All mixing, molding, curing and testing operations on these specimens were carried out at 140 F.

Step 6.—The mixed base material was bladed back and forth across the roadbed until the moisture dropped to one percent, then windrowed on one side of the road, spread in thin layers and rolled with rubber tired rollers until all the material was laid down. The edges were trimmed, the top was shaped with a blade and then finished with a steel roller and inspected by the Inspector in Charge.

Step 7.—Steps 3, 4, 5, and 6 were repeated for the top 2½ in. layer.

Step 8.—MC-4 binder bitumen was spread over the completed base course at the rate of 0.25 gal. per sq. yd. Inspection by the Laboratory Inspector.

Step 9.—Pit-run gravel crushed to ½-in. maximum from the Doon or Rock Rapids pit were spread over the binder bitumen at the rate of 25 lb. per sq. yd. and rolled into the binder. Inspection by the Laboratory Inspector.

Step 10.—Driveway and crossroad base material was placed and sealed to complete the construction.

Moisture control is an important item in bituminous work, and it may be that a specification for the minimum [air] temperature and maximum humidity would be beneficial in controlling the mixing and laying operations.

Another item, important to stability, is the limestone dust additive. It might give a more stable and consistently uniform mix to specify a minimum percent of this additive in the contract rather than to depend entirely on the sieve analysis at the pit for the amount of additive to be used.

General Comments

The actual cost of construction for the 23.379 miles was $307,047.68, or $13,133.48 per mile, which included the total of $2,564.00 or $109.67 per mile for the driveway and crossroad base material.

(*Continued on page* 101)

When competition threatens...

that Pioneer Edge

Why Vaughan & Moon can sell gravel for less

● Vaughan & Moon, Arlington, Virginia, went shopping. They wanted to get the jump on their competition in the important Washington, D.C.—Arlington gravel market. One way suggested itself . . . eliminate expensive truck loading by moving an efficient portable plant directly to the source of the material.

After careful study, these shrewd gravel producers chose a PIONEER 18V plant for the job. They reasoned that PIONEER'S famous Bottom Deck Feed, swivel feed conveyor, method of transfer between return conveyors, and simplicity of drives, offered the extra efficiency they sought.

Today, this little plant is a busy one. Located near Bailey's Cross Roads on Columbia Pike in Arlington County, Virginia, (only 15 minutes from downtown Washington) it's turning out 90-100 t.p.h. of 1¼" minus material with 50% crushing The Arlington County Bureau of Public Roads is an important customer

Did this plant live up to expectations? "It's even better than we hoped", says Clarence Vaughan . . . another skilled operator who has found the way to overcome competition.

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo EQUIPMENT

tips the balance

How Bottom Deck Feed Boosts Production

First: By an ingenious method of feeding and routing material, Bottom Deck Feed provides twice the effective screening area of ordinary plants. This makes it possible to handle a considerably greater screening load without loss in efficiency.

Second: A quick, simple adjustment of the jaw crusher makes it possible to balance the load between the two crushers *while the plant is in full operation*, without changing screens. When material in the pit runs coarse, open the jaw and let the roll crusher do more of the work. When pit material is running fine, close the jaw until it does its full share. Result: both crushers are kept busy . . . and your plant operates at peak efficiency at all times.

There's a Pioneer Portable Plant for every job

Whatever your requirement, there's a PIONEER Portable Plant that will do the job. Duplex plants are now available in seven different sizes, ranging all the way from the little 17V (and 18V shown above), to the big 46VE, with Diesel Electric Drive. All feature the exclusive PIONEER principle of Bottom Deck Feed . . . all offer the famous PIONEER EDGE in performance.

Write for further information . . . *today*.

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☐ ROCK PLANTS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ JAW CRUSHERS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
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Tar Treated Stone Base Roads, Wayne County's Answer

By John E. Hiltz
Engineer of Highway Maintenance, Wayne County Road Commission, Detroit

(Delivered by Mr. Hiltz on March 12, 1952, at the 37th Annual Michigan Highway Conference in Grand Rapids, Michigan)

IN Wayne County, of the some 1,900 miles of county roads, about 43 per cent of the mileage consists of unpaved primary roads. Since these roads are important to the public health, safety and welfare of the county, some means had to be found to provide an all-weather surface. Funds are insufficient to pave all of these roads with concrete or even to provide a secondary type pavement such as asphalt or penetration macadam. Experience has indicated that putting on a gravel surface without building a good base did not solve the "year-round" problem. The solution had to be a good economical type of road metal which could be constructed rapidly and with due regard to the budget.

Stone Base Roads

About two years ago, a program of stone base construction was inaugurated and this program is being continued at a pace commensurate with the availability of funds. The construction is relatively simple, consisting of an 8-inch keyed stone base with a 2-inch stabilized gravel surface. The stone provides the necessary hard foundation while the gravel provides the smooth riding surface. The gravel also has a tendency to keep the traffic from coming into direct contact with the stone and also permits the smoothing of the surface following periods of excessive moisture.

Of course, due regard has to be given to the drainage problem and as a part of the stone base construction, ditches are regraded or opened and culverts constructed as required. All this can be accomplished at about one-fourth the cost of a concrete pavement of equal width and about one-half the cost of a penetrating macadam road.

Along with this type of construction, there must be more rigid control of load limits of commercial vehicles and these roads are posted at certain periods of the year, perhaps more rigidly than the concrete or other higher-type surface.

A stone-base road such as we are building in Wayne County consists of a foundation course composed of crushed aggregates and filler material constructed on a prepared subgrade and finished with a course of maintenance gravel. The aggregate used for the foundation consists of tough durable particles of 100% crushed limestone or slag ranging in size so that all pass a 2½-inch screen, with not more than 15 per cent by weight passing a 1-inch screen. The filler materials specified shall also consist of tough durable particles of 100% crushed limestone or slag and shall be so graded that all shall pass a ⅜-inch screen with not more than 15% by weight passing a #10.

The finishing aggregate used is ordinary maintenance gravel with all passing a ¾-inch screen and from 3 to 10 per cent by weight passing a #200.

Construction Methods

The subgrade to receive the foundation or base course is prepared by trenching to the approved width and depth. This subgrade is smoothed, trimmed and compacted to provide a good clean trench. The base course aggregate is placed in the trench, generally in two layers, each being about one-half the thickness of the section being constructed, the depositing and spreading being started at the point closest to the point of loading and progressing continuously without breaks. Compaction is obtained by means of a 12-ton roller and from the movement of the loaded trucks bonding the material being placed. Successive trips by trucks follow parallel paths so that the whole transverse section benefits from the truck wheels and rutting is avoided. The spreading is from dump boards, spreader boxes or from other equipment attached to the trucks to distribute the material in a uniform layer.

The filler material is spread in a uniform layer over the loose spread base course layer and is blended into the base course by hand raking or other similar methods which produce the required results.

The finishing course of maintenance gravel is spread uniformly in a single layer. After being so spread, it is floated with an approved road maintainer or grader until the surface is free from waves and irregularities. Additional materials are added to fill depressions should they occur.

Needless to say, extreme care must be used to prevent the stone or gravel being mixed with mud and in case of a muddy subgrade where the aggregate cannot be compacted or where mud is forced through the stone, the aggregates are removed, the trench cleaned and new materials placed.

Bituminous Surface

Stone base roads still leave us with the dust problem and the surface problem of "chatter bumps" and "chuck holes." This problem is now under study and in some cases has been remedied by the application of an inexpensive bituminous surface. The treatment can be applied after the stone base road has been subjected to traffic for a year or more.

After floating the gravel surface to take out irregularities, a thin coat of 3/10 of a gallon of liquid tar per square yard is sprayed on the surface and allowed to penetrate under traffic for ten days. After this period, the surface is then given a liquid asphalt treatment of a half gallon per square yard and limestone chips, ⅝-inch maximum size, are then spread and the surface is rolled. This latter treatment is then repeated. After this application the surface is then sealed with asphalt, about 3/10 gallon per square yard and chips passing a ⅜-inch screen are spread and rolled. This entire process provides a mat approximately an inch and a half in thickness.

Experience has shown that a stone base road with the bituminous mat will produce an economical riding surface, dust-free and with riding qualities of a high type surface.

C. H. Buckius has been appointed Chief Engineer of the Pennsylvania Department of Highways, it was announced by E. L. Schmidt, Secretary of Highways. The promotion fills the vacancy created by the elevation of Mr. Schmidt to Secretary following the death of the late Ray F. Smock.

★ Pioneer primary crusher and secondary roll crusher unit with tandem belts set up for the base stone production. U. S. 21, West Virginia

This Plant Produced 45,000 Tons of Subbase Gravel

ONE of West Virginia's heaviest postwar highway projects is the 5-mile Ripley-Fairplain relocation on U.S. 21. The paving contract by Anderson, Inc., of Charleston, was in progress during 1951.

[The design of this project was described by R. F. Baker in an article, "Design and Construction of a Relocation for Heavy Traffic"; ROADS AND STREETS, November, 1951.]

One of Andersons' first jobs was to produce and apply 45,000 cu. yd. of crushed gravel for the subbase. This material was produced working successively from two nearby ledges, the second ledge being opened up after the shovel ran into soft, unacceptable material. A 1-yd. Lima shovel, equipped with undersize (¾-yd.) dipper, produced as high as 918 cu.yd. of stone in a 10-hour day, aided by a D6 Caterpillar dozer and a Lorain motor-crane with 4,000-lb. ball for breaking oversize. An Ingersoll-Rand 315 compressor and one I-R wagon drill were used, with 40% Atlas Ammonia Gelatin for blasting without secondary shooting. Quarry output was hauled to the crusher with Mack Model XH trucks.

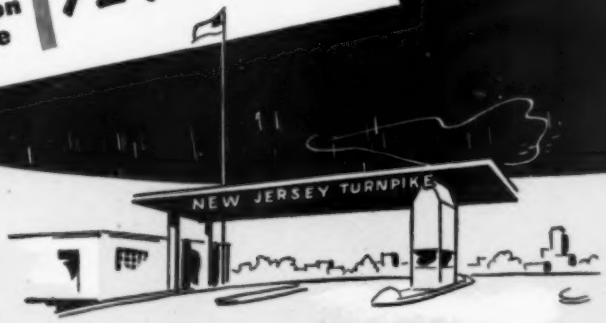
(*Continued on page* 100)

★ Pettibone-Mulliken "speed loader" sending out stock-piled base gravel

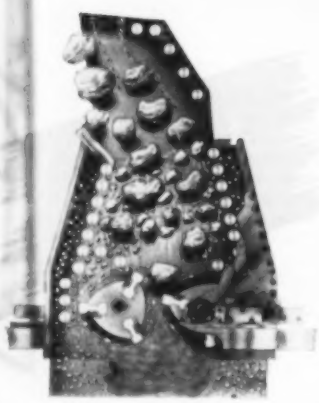
★ Lima crane with undersize bucket to reduce wear and tear loaded quarry stone under the severest conditions. Mack dump trucks used

"That's why Double

✓	Original schedule	400 tons per hour
✓	Daily average maintained	600 tons per hour
✓	Peak day production average	724 tons per hour



The Inside Story OF DOUBLE IMPELLER IMPACT BREAKER PRODUCTION



Approximately 80% less contact of stone on metal, because such a high percentage of material is broken in suspension.

Extremely high ratio of reduction at very low power costs.

Maximum output of cubical shaped aggregate required in so many specifications.

Minimum amount of accessory equipment such as secondary crushers, conveyors, hoppers, screens, elevators, etc.

U. S. Pat. Nos. 2373691, 2486421
Canadian Pat. No. 439371

WITH a contract for three quarters of a million tons calling for seven sizes of crushed rock ranging from asphaltic concrete stone to 3-inch base rock, Concrete Materials and Construction Company wanted a primary reduction unit that would give them big volumes of specification aggregate in one operation. That's why they selected a 5050 Cedarapids Double Impeller Impact Breaker!

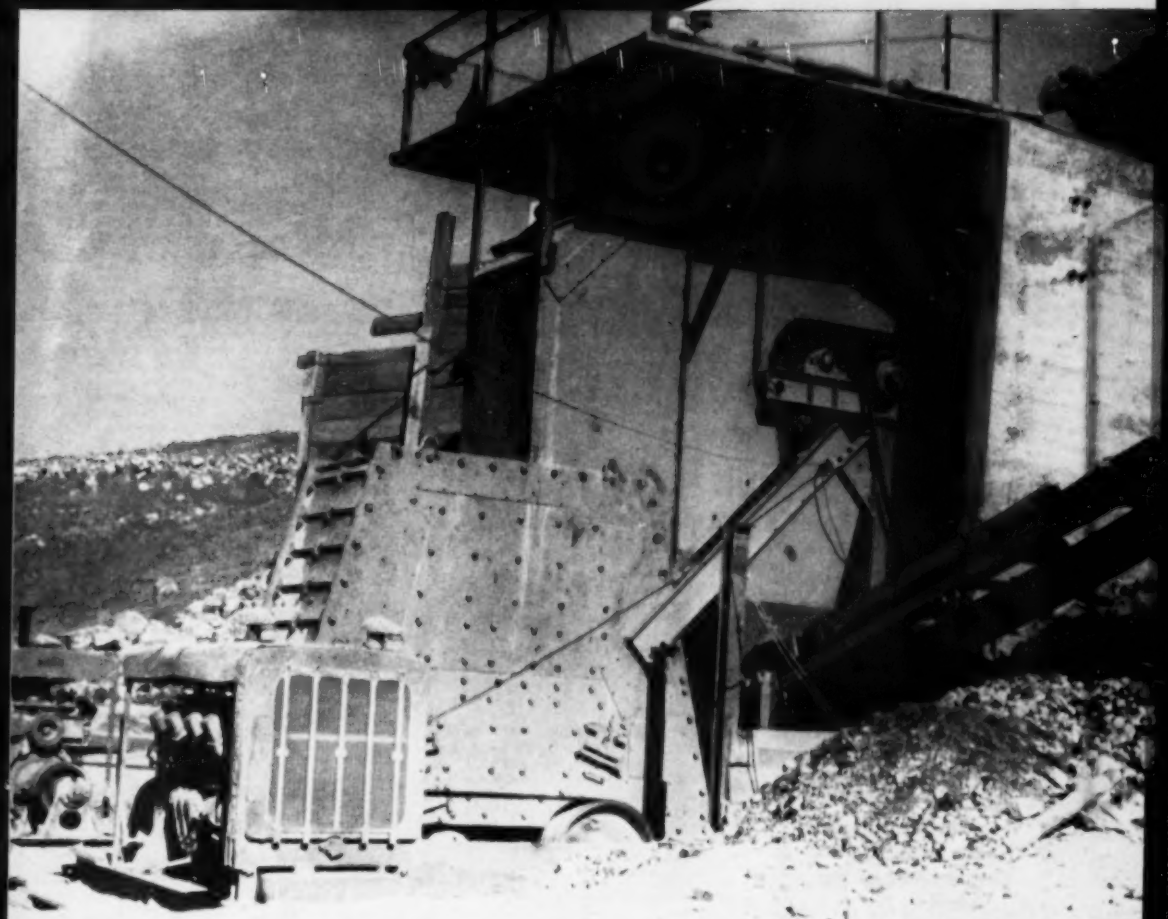
Originally scheduled to produce 400 tons per hour, the big breaker consistently averaged more than 600 tons an hour of primary crushing and reached a peak average over a 20-hour period of 724 tons. The feed was quarry rock that would pass a 50-inch square opening. The output was a cubical, 3-inch minus that met the toughest specifications. No wonder more and more producers of cubical aggregate are depending on the low cost, big volume production of Cedarapids Double Impellers!

Whatever your requirements for crushing and screening or bituminous mixing equipment, be sure to talk to your nearest Cedarapids distributor. You'll be way ahead if you do.

THE **IOWA** LINE *of Material Handling Equipment Includes:* ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS • FEEDERS • PORTABLE POWER CONVEYORS • PORTABLE AND STATIONARY STONE, GRAVEL AND SAND PLANTS • REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • DRIERS • DUST COLLECTORS HAMMERMILLS • WASHING PLANTS • VIBRATING SOIL COMPACTION UNITS • DOUBLE IMPELLER IMPACT BREAKERS

we bought a Cedarapids Impeller Impact Breaker"

Says Concrete Materials and Construction Co.
Cedar Rapids, Iowa



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COST REDUCING EQUIPMENT

IOWA MANUFACTURING CO.

Cedar Rapids, Iowa, U.S.A.

WITH THE MANUFACTURERS & DISTRIBUTORS

Cummins Promotes Weber. John T. Weber, heretofore assistant to the controller of Cummins Engine Co., Inc., Columbus, Ind., has been appointed manager-sales development. His duties will include the coordination of the company's advertising, technical literature, market research, sales training and publicity programs.

New Distributors for Drill Bit & Tool Co. New distributors for forged steel rock bits for Drill Bit & Tool Co., Pittsburgh, Pa., are as follows: Allied Equipment, Inc., Miami, Fla.; Austin Powder Co., Cleveland, O.; Guyan Machinery Co., Logan, W. Va.; Mine & Mill Supply Co., Birmingham, Ala.; Schroeder Brothers, Pittsburgh, Pa.; and E. F. Marsh Co., St. Louis, Mo.

Holsing Promoted by Timken. R. H. Holsing, heretofore a design engineer for The Timken Roller Bearing Co., Canton, O., has been appointed assistant chief engineer of the Rock Bit Division.

Kingman Joins Illinois Contractors Machinery. William W. Kingman, formerly general sales manager of the Manufacturing Division of the Maxon Construction Co., Inc., Dayton, O., has joined the Melrose Park Ill., branch of Illinois Contractors Machinery, Inc., and will direct their sales program in the Chicago area.

New LeTourneau Distributor. Rocky Mountain Machinery Co., 1485 South Second West St., Salt Lake City, Utah, has been appointed distributor for R. G. LeTourneau, Inc., Peoria, Ill., for entire state of Utah, three counties in Wyoming and 13 counties in Idaho.

Appointed Cleaver-Brooks Representative. Dyke & Tutsch Co., 3253 North Green Bay Ave., Milwaukee, Wis., have been manufacturer's representative for sale of Cleaver-Brooks boiler equipment in nine counties in southeastern Wisconsin. Dyke & Tutsch Co. is a newly formed agency partnership composed of R. J. Tutsch, formerly sales manager of the Boiler Division of Cleaver-Brooks, and T. P. Dyke, former city sales engineer of the Boiler Division of Cleaver-Brooks.

Bucyrus Steel Products in Production. The recently organized Bucyrus Steel Products, Bucyrus, O., has moved into its especially designed modern factory at 260 E. Beal St., and is now in full-scale production of "precision punched" blades and cutting edges for motor graders, bulldozers, maintainers and snow plows.

Appointed Western Mines Representative. Earl A. Lerner, formerly in charge of sales and engineering in southern California for Amsco, has been appointed western mines representative for Pioneer Engineering Works, Inc., Minneapolis, Minn. He will cover the southwestern states.

Standard Steel Promotions. Standard Steel Corporation, Los Angeles, Calif., has announced promotion of C. N. Rees to vice president in charge of manufacturing in addition to his duties as sales manager. K. G. Thies has been elected to the board of directors and appointed secretary. Robert J. Johnson, purchasing agent, has been elected to the board of directors and appointed treasurer.

Asphalt Mix Tonnage Rises in New York State

State Highway Construction and Maintenance took 43% more higher tonnage of asphaltic concrete in 1951 than in 1950, according to a report issued by Gus Rayner, Executive Secretary of the New York State Bituminous Concrete Producers' Association of Albany, New York.

Tonnage for the year of state road work, and not including other public or private work, totalled 939,615 tons. Construction and reconstruction took the sharpest increase.

Tonnage figures are given in the accompanying tables:

	1947	1948	1949	1950	1951
Special Projects	288,325	243,006	270,545	222,103	297,923
Maintenance	96,479	123,873	117,958	138,261	115,028
Construction and Reconstruction	378,212	544,134	536,173	294,937	526,663
Total	763,016	911,013	924,676	655,301	939,615

	Special Projects	Maintenance	Construction Reconstruction	Totals
Steam mix	230,777	59,922	121,814	412,513
Type 1A	44,279	3,934	353,894	402,107
Type 2A			31,825	31,825
Type 3A	11,681	33,818	6,024	51,523
Type 4A			18	18
Type 5A	11,186	2,848	1,274	15,308
Colprovia			1,561	1,561
Warcolite		1,085		1,085
Winter Patching		13,421		13,421
Sheet Asphalt			10,253	10,253
Totals	297,923	115,028	526,663	939,615

Notes on Equipment and Materials For ENGINEERS AND CONTRACTORS

1
Tape for Insulation

A new oil-resistant tape for rapid insulation build-up on splices, announced by Minnesota Mining and Manufacturing Co., is made of sythetic rubber. The Chemical-resistant qualities of the tape are stated to make it especially suitable for use in oil drilling, mining and under ground cable operations, while the 40-mile thickness and extreme stretch (1500% breaking point) make possible

Tape for Splices in Large Cables

smooth insulation wraps on irregular surfaces. Dielectric strength is 15,000 volts unstretched, and 10,000 volts at 500% elongation. It has an electrolytic corrosion factor of 1.0 and an insulation resistance of 100,000 megohms. The tape is available in ¾ in. by 15 ft. rolls, is green-colored, and has a white strippable liner to be removed before use. Since it fuses to itself, forming a solid homogeneous mass, it requires no adhesive. Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul, Minn.

2
Continuous "V" Packing

A new, continuous chevron-type packing designed for 500-6000 p.s.i., and available in styles for either high or low temperatures, has been announced by the Mechanical Packing Division of Flexrock Co. Packing size is the only dimension that need be given when ordering "Continuous-Vee," as the user cuts his own rings on the job to fit specific rod and stuffing box dimensions. The packing is offered in two styles; No. 2005 is constructed of the best asbestos cloth and neoprene and No .2008—for lower temperatures—is made of the best cotton duck and neoprene. Top and bottom adaptors in continuous form are available for both styles. Mechanical Packing Division, Flexrock Co., 3670-B Cuthbert St., Philadelphia 4, Pa.

Flexrock "Continuous-Vee" Packing

3
Two New Scrapers

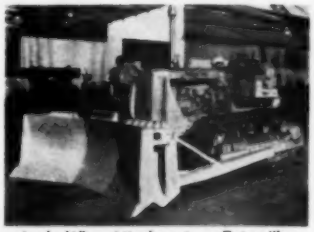
A pair of new scrapers for use with Cat DW10 tractor have been announced by Caterpillar Tractor Co. The new Cat No. 10 scraper is somewhat lighter than before, with capacity of 7 cu. yd. struck and 9 cu. yd. heaped. For heavier applications where a pusher is more important, the Cat No. 15 scraper has been provided. The No. 15 has a capacity of 10 cu. yd. struck and 13 cu. yd. heaped. Top extensions (sideboards) may be attached to either scraper for increased capacity where the material does not

Cat. No. 10 Scraper

exceed a weight of 2,800 lb. per cubic yard. The scrapers are similar in basic design. Both have a flat, double-bottom bowl of high-tensile steel. A "stinger" blade with reversible cutting edge is standard equipment. Cable rigging provides for positive loading and ejection. The wheels turn on tapered roller bearings. Air brakes are synchronized with the tractor brakes. The No. 10 Scraper totals 15,440 lb. for shipping and has a maximum carrying capacity of 11.5 tons. Figures for the No. 15 include a shipping weight of 17,850 lb. and a 17-ton maximum carrying capacity. Caterpillar Tractor Co., Peoria 8, Ill.

4
Angle Wing for Dozer Blades

Shepherd angle wing attachments (patent pending) for bulldozer blades have been announced by Shepherd Tractor & Equipment Co. The attachments are available for all bulldozers. They are claimed to provide the advantage of a "U" type bulldozer for carrying large yardages greater distances, together with the ability to side cast, back fill and pioneer hillside cuts, excavations and roadways by the use of a single wing. Users with a regular bulldozer blade can now have the above advantages and can, of course, easily remove the angle wings and use the bulldozer as a pusher. The manufacturer states angle wing attachments have been produced and mounted on a variety of models of Caterpillar tractors for such contractors as Macco Corp., Morrison-



Angle Wing Attachment on Caterpillar D6 Diesel Tractor

Knudsen, United Concrete Pipe Corporation, and other prominent firms. Shepherd Tractor & Equipment Co., Atlantic & Bandini Blvds., Los Angeles 22, Calif.

5
Power Roller

A new power roller, introduced April 10 by Soilaire Industries, weighs from 720 lb. light to 1725 loaded, with operator. The roller is of all steel construc-

The Rollpac

tion, built of formed steel channels and plates. It is powered by a 5 HP Briggs and Stratton engine, and has Twin Disc clutch and Toro planetary transmission. Hollow rolls are built of 3/16 in. plate. It has a double seat position for forward and reverse operation. Soilaire Industries, 1200 Second Ave., Minneapolis 3, Minn.

6
Reinforcing Rod Cutter

A new model Guillotine hydraulic cutter, announced by Manco Mfg. Co., weighs 12 lb. is 21 in. long, and cuts

Model 200-A Guillotine Hydraulic Cutter

Wherever Engines Work...

they need PERFECT OPERATING TEMPERATURES for

It's a fact! To get all of the power, life and performance which has been designed and engineered into it . . . an engine MUST operate at its most efficient temperature . . . constantly!

That's what KYSOR Automatic Shutters team up with motors to supply . . . perfect operating temperatures, with resulting longer engine life, fuel savings, and fewer major overhauls.

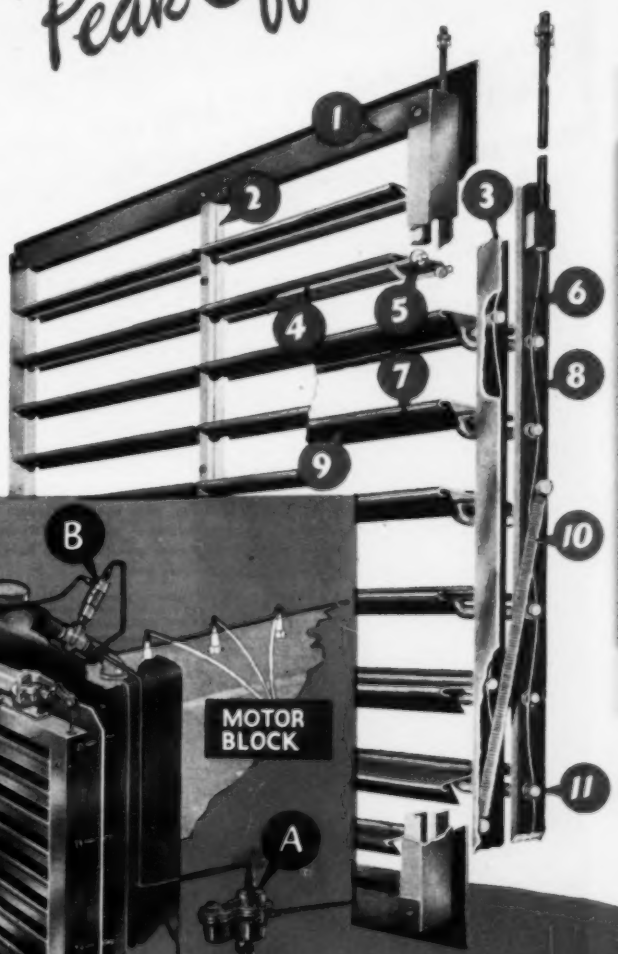
In trucks, diesel locomotives, stationary engines, heavy construction machines . . . wherever engines work, KYSOR makes em produce MORE—LONGER!

Write for catalog and complete information.

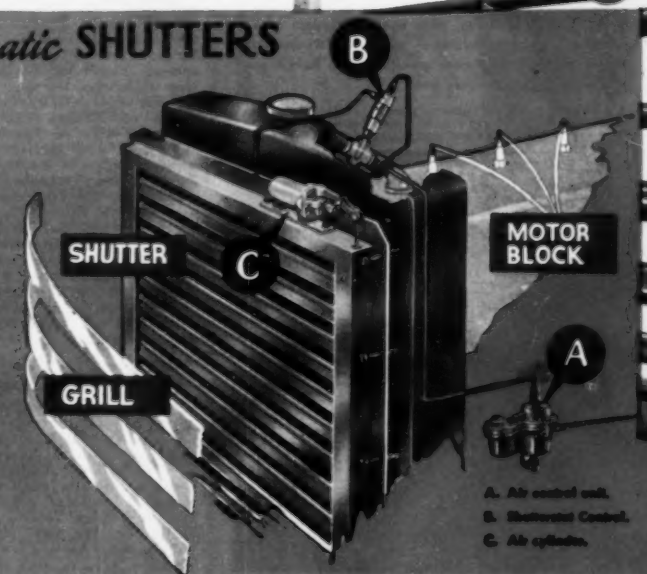
they get it with

KYSOR

Peak Efficiency



Automatic SHUTTERS



A. Air control unit.
B. Thermostat Control.
C. Air cylinder.

End connects on sub-assembly view shows KYSOR'S eleven key points of rugged construction. Other automatic controls are available to fit your engine requirements.

KYSOR HEATER COMPANY • CADILLAC, MICHIGAN

up to ½ in. reinforcing rods with ease. Features on the new Manco Model 200-A are a pressure of 8500 lb. per square inch, exerting 10 tons thrust in a hand operated unit. Also important is a newly designed dual ratio pump which combines rapid traverse with high power to minimize cutting time. Manco engineers state that reduced operator effort minimizes the tendency of the operator to twist unit while cutting, this twist motion being the major cause of bolt cutter blade breakage. Easily resharpened blades are alloy tool steel. The Manco Manufacturing Co., Bradley, Ill.

7
Drill Has Three Methods

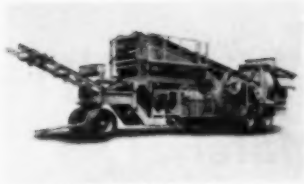
A new combination drill offering all three methods: rotary, auger and percussion drilling on the same rig is a feature of the latest drill rig of Mobile Drilling Inc. This new mobile drill has a hydraulic feed of approximately 8,000 lb. pressure. The hydraulic feed cylinder is located directly over the rotary turn table. The carriage of the drill is of

B-36 Drill Mounted on Jeep

tubular construction. The drill mast, also of tubular construction, nests in the tube members of the drill carriage for cross-country travel with a maximum over-all height of 10 feet. The drill mast telescopes together with the feed cylinder hydraulically to an operating height of 16 feet. The drill can be furnished with an auxiliary cat head, sand reel, and special high pressure water pump. The maximum depth for auger drilling without water is approximately 150 feet; depth for rotary drilling with water is in excess of 300 feet. The drill can be mounted on a Willy's Jeep or any truck with a power take-off. The drill can use either 3 ft. or 5 ft. augers from 3 in. to 10 in. diameter. It also can handle drill stems in 10 ft. sections. Mobile Drilling Incorporated, 960 North Pennsylvania St., Indianapolis, Ind.

8
Gravel Plant

An addition to the 880 gravelmaster series of portable crushing, screening and loading plants, announced by Universal Engineering Corporation, a division of Pettibone Mulliken Corporation, incorporates new engineering developments to increase capacity, yet keep traveling weight within state highway limitations. The plant features a 10 in. x 36 in. roller bearing jaw crusher, 30 in. diameter x 22 in. face star gear roller

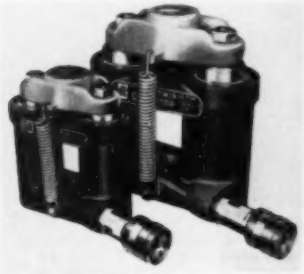


880 Senior "R" Gravel Plant

bearing roll crusher, and a 4 ft. x 10 ft. 2½ in. deck inclined gyrating screen. The plant is driven by a single 115-125 h.p. power unit mounted on the plant, or by a separate side drive through a universal joint connection from separate truck mounted power. The plant can be fed by shovel, truck, or dragline direct from pit to hopper or with optional swivel feed conveyor. It also can be combined with a Universal 546P primary for quarry operations. Universal Engineering Corporation, 625 C. Ave. N. W., Cedar Rapids, Ia.

9
30-Ton Hydraulic Ram

A new 30 ton power-twin hydraulic ram, announced by Owatonna Tool Co., is similar in design and with the same features as the OTC 17½ ton ram, but has almost twice the power. Weighing only 23 lb. and with the center hole construction, the new 30 ton ram is



OTC 30-Ton Ram

stated to do pulling and installing jobs heretofore thought impossible. It works in any position, is fully adjustable, eliminates torque and takes the hard work out of pulling and installing operations. The new ram is 6¾ in. high, 17½ in. wide, 3 in. thick and has a 2½ in. ram travel. Both the 17½ and 30 ton rams work off the same size pump which operates by remote control to insure safety. Complete sets of attachments are available for use on industrial tractors, earthmoving equipment, for industrial plant maintenance and a wide assortment of pulling and installing operations. Owatonna Tool Co., 435 Cedar St., Owatonna, Minn.

10
Front End Loader

A new all-hydraulic Scoopmobile, Model H, has been announced by Mixermobile Manufacturers. The Model H comes equipped with ¾ yd. scoop, has a rated lift capacity of 4000 lb., the standard discharge height is 8 ft. Vickers hydraulic steering, combined with Mixermobile planetary drive, are stated to provide the maneuverability and the power to make the Model H a versatile and efficient front-end loader. Attach-

RECLAIM WORN-OUT *Surface Material on* BITUMINOUS ROADS *with* HYSTER® Grid Roller

On this black top salvage job in California, Hyster Grid Roller and Caterpillar Motor Grader did in 10 HOURS what it would have taken 7 or 8 DAYS to do with old methods.

Saves 5 Ways

✓ **TIME** — The Grid Roller pulverizes old surface material, compacts road base and new surface courses faster and better than old-style methods and equipment.

✓ **MATERIAL** — On normal salvage, the Grid Roller provides sufficient mix from old material for laying down new surface.

✓ **BINDER** — Usable binder in salvaged material is exposed, thus often reducing new oil required from ⅜ to ⅜ gal. per sq. yd.

✓ **EQUIPMENT** — The Grid Roller does triple duty — reclaims old mat, compacts base, rolls new surface courses.

✓ **LABOR** — One operator performs simultaneously the pulverizing and scarifying or blading operations. Faster road reclaiming also means less labor time on the job.

BITUMINOUS ROAD SALVAGE has been revolutionized by the Hyster Grid Roller. Now it is **economically possible** to salvage, rejuvenate and use the old, worn-out surface material for re-laying the new road surface.

The procedure: (1) SCARIFY or rip up the worn surface; (2) PULVERIZE—Grid Roller reduces chunks to original loose road mix; (3) PREPARE BASE — compact with the Grid Roller; (4) LAY DOWN new surface, using salvaged road mix material, and rolling out with Grid Roller; (5) TURN OVER TO TRAFFIC.

From coast to coast CITY, COUNTY, STATE, FEDERAL and PRIVATE ROADS are being reclaimed at great savings in time, oil, material, labor and equipment. The nature of the job determines whether the Grid Roller should be towed by a motor grader or tractor.

See your Caterpillar-Hyster dealer. Write for literature.

HYSTER COMPANY

2995 N. E. CLACKAMAS ST., PORTLAND 8, OREGON
1895 NORTH ADAMS STREET, PEORIA 1, ILLINOIS

Model H Scoopmobile

ments for the Model H Scoopmobile include: Swivel type concrete hopper, lift forks, special fertilizer or hay fork, and crane boom. Mixermobile Manufacturers, 8027 N.E. Killingsworth St., Portland, Ore.

11
Bogie Wheel

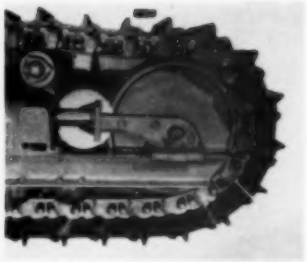
Production of a new one-unit bogie wheel (roller) for crawler-type tractors has been announced by Sterling Steel Casting Co. Made of sturdy castings that assure uniform hardness, the new roller comes completely assembled including

Sterling Bogie Wheel

bearing adjustment and lubrication. An exclusive positive-seal keeps out all foreign material. Timken bearings are included. In addition, an exclusive Sterling locking device is stated to assure perfect bearing adjustment and alignment at all times. The wheel is easily dismantled for quick, simple repairs and maintenance. Sterling Steel Casting Co., East St. Louis, Ill.

12
Track Adjuster for Crawler Tractors

The Hydradjuster, a new patented hydraulic track adjuster available for all models of Allis Chalmers, Caterpillar and International crawler tractors is claimed to pay for itself within six months in time alone saved in adjusting the tracks by the hand method. In addition it is claimed that, due to the ease of adjusting tracks, the operator will keep the tracks of his crawler tractor adjusted properly, thus eliminating unnecessary wear on rails, idlers, rollers, sprockets and other mechanical



The Hydradjuster Installed on Crawler

parts. Installation of the Hydradjuster can be made in the field. Once the tracks have been broken, it can be installed in approximately 1½ hours. Machinery Parts Sales Corporation, P.O. Box 7682, Dallas, Tex.

13
Grapple

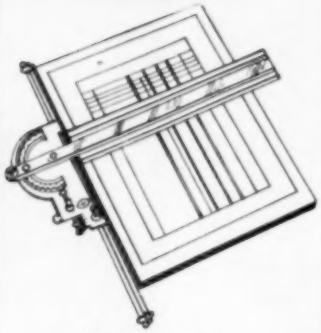
A new all steel welded grapple, designed to facilitate loading of pulpwood, railroad ties, and similar materials with the 5-ton capacity truck-mounted Bantam crane, has been announced by Schield Bantam Co. Rated at ¼-cord capacity, the new Bantam grapple has a tong

5-Ton Capacity Truck-Mounted Schield Bantam Crane Equipped with ¼ Cord Grapple

opening of 5 ft. 3 in. with a gross weight of 1155 lb. Overall length of tong blade is 2 ft. 8 in., while overall grapple height is 5 ft. 2 in. Constructed of cold rolled steel shafting and angle irons, with easily lubricated zerk fittings and bronze bushings in sheaves, the unit is said to combine light weight and excellent balance with unusually rugged strength and fast, easy operation. Schield Bantam Co., Waverly, Ia.

14
Forms Rulers

Two new forms rulers, announced by Michael Lith Co., are claimed to enable anyone to make a form equal to that made by a professional draftsman or printer but in ⅕ of the time. By a very simple operation, parallel lines, either horizontal, vertical or diagonal can be spaced from a thousandth part of an inch up to an inch or more on any size sheet. A controlled index wheel on the Paraliner board is set against a measuring scale at the desired space. Then step by step, the ruling edge is moved forward with slight pressure of thumb and forefinger, while the person operating it draws the lines already set by the index. The Paraliner line-up and light table is an all-steel frame table



Paraliner Forms Ruler

with the Paraliner ruler built into a glass board which lights up from the inside. An important added feature is the ruling measure, controlled by micrometer precision. The entire glass table top will tilt and will rotate completely on an axis and will lock at any angle. The Paraliner is claimed to be especially useful in drafting and engineering layouts because of the built-in micrometer precision instrument. Michael Lith Co., 145 West 45th St., New York 36, N. Y.

15
Pipe and Bolt Threading Machine

A new Ridgid "500" pipe and bolt threading machine, announced by The Ridge Tool Co., has a new type of

"EUCS" for

Powered by two 200 h.p. diesel engines, Model FFD "Eucs" haul 34 ton loads of earth and rock overburden at Monroe Mine of Oliver Iron Mining Co. in Minnesota.

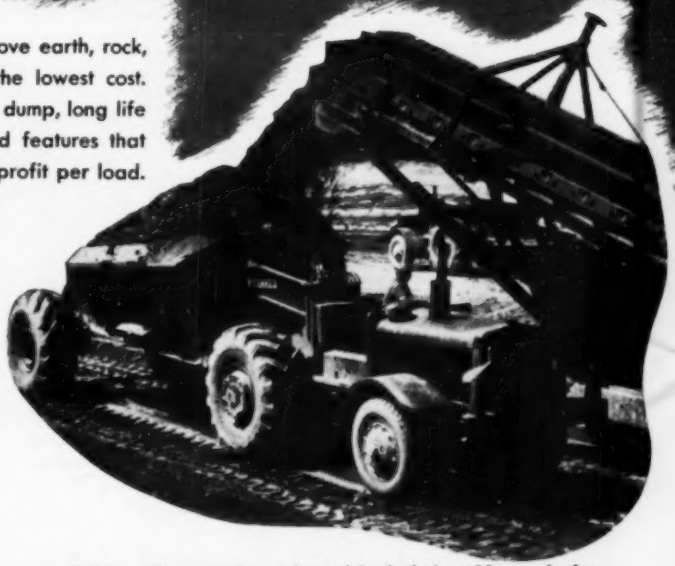
LOW COST HAULING ON TOUGH JOBS

Euclids are designed and built to move earth, rock, coal, ore and heavy excavation at the lowest cost. Large capacity, speed on the haul and dump, long life in heavy duty service, these are Euclid features that assure more loads per hour and more profit per load.

They haul big loads! Bottom-Dump Euclids have capacities of 13 to 25 cu. yds., Rear-Dump "Eucs" from 10 to 34 tons.

"Eucs" are fast! Top loaded speed of the Bottom-Dump is 34.4 m.p.h. Rear Dumps travel up to 36.3 m.p.h. with full payloads. They're powered by diesel engines from 125 to 400 h.p.

Whether you have a tough off-the-highway hauling job, or one where conditions are good, Euclids are your best bet for low cost hauling and long, dependable service.



A Bottom-Dump receives a heaped load of about 18 cu. yds. from a Euclid Loader during construction of an access road to a Hydrogen Bomb Plant site in South Carolina. Contractor: R. B. Potashnick.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLIDS *Move the Earth*

self-contained die head, claimed to reduce first cost and to make notable savings of work and time. The new Quadritype die head is instantly adjustable to thread 1 in. to 2 in. pipe, including over and under size, regardless of position of quick-opening lever and without removing dies or die head from the machine. The new improved Dual-type die heads, one for ¼ in. and ⅜ in. and one for ½ in., and ¾ in., offer this this same instant size change right in the machine. Monotype die heads, ⅛ in. to 2 in., and bolt die heads, ¼ in. to 2 in., which adjust to over and under size in the machine, are also available. All tools in the new "500" thread, cut and ream independently and right up close to the chuck, and swing up out of the way when not in use. The Ridge Tool Co., Elyria, O.

Subbase Gravel

(*Continued from page 85*)

Crushing on a two-shift basis was performed at a single set-up by a plant consisting of the following units, all supplied by Pioneer except when otherwise noted:

Apron feeder.

No. 2036 primary jaw crusher, mounted on mobile chassis and powered (along with feeder) by a Caterpillar D8800 diesel power unit.

30" x 22½' belt.

Secondary 40" x 22" roll crusher with a Caterpillar D13000 power, mounted as a mobile unit.

30" x 20' belt, rubber tire mounted unit, powered by a Wisconsin air-cooled gasoline motor.

30" x 37½' belt, rubber tire mounted unit, with Buda motor.

Other equipment used by Anderson around the crusher included a Pettibone-Mulliken "Speedloader" for loading stockpiled material into trucks for haul to the job; Ford and Chevrolet dump trucks and Winslop pit scales.

Subbase material was spread and compacted with the Allis-Chalmers motor grader, an Allis-Chalmers HD-10 tractor with Gar-Wood dozer and a Huber 8-ton tandem roller. A Hetherington-Berner asphalt plant was to be erected for the hot-mix courses.

Traveling Plant Mix

(Continued from page 81)

The total cost, to Lyon County, for the inspection on these projects was $6,291.74, or $269.12 per mile. Inspection costs would have been slightly lower if the weather had been favorable to continuous operation.

In the late fall, after the ground had frozen, pit-run gravel, crushed to ¾-in. maximum, was spread over the two-foot shoulders up to the top of the mat and compacted with the tires of a motor patrol.

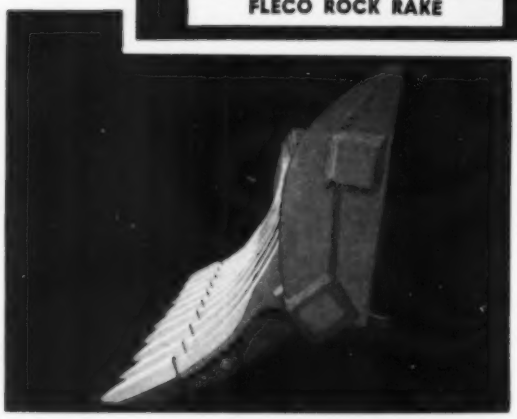
In general the criticisms of our projects were as follows:

1. The roads were built in the wrong place.
2. The crown was too high.
3. The roads were too narrow.

Of these three criticisms, that of the narrow roads interested me most. I could not understand at first why people who have been driving over an 18-ft. pavement for years would say that of a 22-ft. bituminous road surface was too narrow until I noticed that tire tracks were almost 5 ft. from the edge of the mat, which was 5 inches above the shoulder. This meant that the effective width of the top was only 12 ft. Widening the shoulders two feet on each side with gravel has eliminated this criticism. However, through driving habit cars still keep 3 ft. from the edge of the mat.

County engineers are possibly in closer contact with public opinion than highway commission officials, and there is a growing demand, at least in our county, for wider roads, both secondary and primary.

FLECO ROCK RAKE



FLECO Rock Rakes are easily installed on the standard straight or angle bulldozer arrangements in place of the moldboard. The teeth are detachable and made of strong, durable, abrasive-resistant steel, designed with a curve for maximum efficiency. FLECO Wearing Caps, as shown in photograph, are attachments to prolong the life of the teeth by taking the brunt of the wear and are replaceable at low cost. The openings between the teeth allow the dirt to pass through, leaving the objects in front of the Rake to be moved with full concentration of tractor power.

FLECO®

Land Clearing Equipment

FOR USE WITH TRACK-TYPE TRACTORS FOR ALL KINDS OF CLEARING

ROCK RAKE
ROOT RAKE
BRUSH RAKE
DETACHABLE STUMPER
TREE CUTTER
TREEDOZER

DISTRIBUTED BY **FLECO**-"CATERPILLAR" DEALERS ALL OVER THE WORLD

FLECO CORPORATION

1551 WEST CHURCH STREET • POST OFFICE BOX 2317
JACKSONVILLE 3, FLORIDA, U. S. A.

Rogers Holds Salesmen's School

The first annual sales school for salesmen of Rogers Brothers Corporation held Jan. 24 and 25 in Albion, Pa., was attended by 90 salesmen representing 22 states. In addition two men from Toronto, Ont., were present, as well as the export distributor from New York. The purpose of the school was to educate all Rogers salesmen in the field as to engineering, design, and latest developments in Rogers trailers, and also competition in the field.

A. O. Cuthbert

A. O. Cuthbert, 55, died suddenly Friday evening, March 21, at his home at 724 Rosewood Avenue, East Lansing, Michigan. He had been Engineer-Director of the County Road Association of Michigan for the past 7½ years.

Mr. Cuthbert leaves a remarkable record of activity and accomplishment in both civic and highway affairs. He was currently serving as President of the Michigan Good Roads Federation. He was a past president and director of the American Institute of Local Highway Administration, a director of the Michigan Institute of Local Government. He is past president and lifetime member of the Michigan Construction Equipment Dealers' Association. He is past president and past district governor of the Lansing Exchange club; member of Lansing Lodge No. 33 F. and A.M.; member of the Capital Chapter No. 9; member of the Lansing Commandery No. 25, K.T.; former district chairman of the Boy Scouts; past president of the University of Michigan club of Lansing; past state chairman of the State Model Aircraft Association. He was currently serving as a member of the East Lansing Traffic Commission. He was a registered, professional engineer and a member of the Grand Valley Chapter of the Michigan So-

★ A. O. Cuthbert

ciety of Professional Engineers and the Lansing Engineering Society. He was the first president of the Lansing chapter of the Society for the Preservation and Encouragement of Barbershop Quartet Singing in America.

Review of Gillette's Heavy Construction Catalog File

(*Continued from April* ROADS AND STREETS)

This first annual edition is a compilation of catalogs of manufacturers serving the heavy construction field with materials, equipment, and accessories. Manufacturers' catalogs are bound in the book alphabetically. To assist the user there are three indexes, as follows:

1. Manufacturers Index (alphabetically arranged)
2. Product Index (alphabetical by products advertised)
3. Trade Name Index (alphabetical)

Copies of the individual catalogs of manufacturers included in this book can be obtained by writing direct to the manufacturer.

Following is a short review of each manufacturer's catalog: (continued from April issue).

Maginniss Power Tool Co., Mansfield, Ohio. An 8-page catalog of descriptive matter, specifications and illustrations of Maginniss Hi-Lectric concrete vibrators and generators.

Marlow Pumps, Greenwood Ave., Ridgewood, N. J. A 2-page catalog sheet on contractors' pumps. Marlow distributors are listed.

Master Vibrator Co., Dayton 1, Ohio. This 4-page catalog illustrates and describes Master products, including concrete finishing screeds, concrete vibrators, electric hammer tools and attachments, space heater, and portable electric generator plants.

W. R. Meadows, Inc., Elgin, Ill. An 8-page catalog on Sealtight paving products containing descriptive matter and illustrations on asphalt, corkfill and fibre expansion joints, centerstrip, dummy joints, concrete curing compounds, rubber asphalt joint seal and road marking paints.

Michigan Power Shovel Co., Benton Harbor, Mich. Features of the Michigan excavator cranes are described in this 4-page catalog. Illustrations, descriptions, and specifications for six models are included.

Mir-O-Col Alloy Co., Inc., 312 North Ave. 21, Los Angeles 31, Calif. A 2-page catalog sheet illustrates and describes the Mir-O-Col automatic welding positioner control.

Morin Manufacturing Co., Inc., West Springfield, Mass. The Tag Master, a combination tagline winder and dipper trip, is illustrated and described in this 2-page catalog sheet.

Omaha Standard, 2411 West Broadway, Council Bluffs, Iowa. A 2-page catalog

sheet on the center dump trailer, containing descriptive matter, illustrations and specifications.

Onan & Sons, Inc., D. W., 3495 University Ave., S. E., Minneapolis 14, Minn. Onan diesel electric plants and gasoline-driven electric plants are illustrated and described in this 2-page catalog sheet.

Osgood Co., The, Marion, Ohio. In this 4-page catalog, two pages are devoted to specifications for 13 models of crawler mounted shovels and cranes, five models of mobilcranes and three models of truck cranes. Descriptive matter and illustrations are included.

Oshkosh Motor Truck, Inc., Oshkosh, Wis. A 2-page catalog sheet illustrating and describing Oshkosh gasoline or diesel engine powered 4 and 6-wheel drive trucks.

Ottawa Steel Products, Inc., Ottawa, Kansas. The Ottawa self-propelled hydrahammer for cutting asphalt, backfill tamping, concrete breaking and the Ottawa loader are illustrated and described in this 2-page catalog sheet.

Owen Bucket Co., 6050 Breakwater Drive, Cleveland 2, Ohio. Four types of Owen buckets are illustrated and described in this 2-page catalog sheet. Illustrations and descriptions also are included on grapples and round nose construction for buckets.

Pacific Car and Foundry Co., Renton, Wash. Carco single and double drum winches for all makes of tractors are illustrated and described in this 4-page catalog.

Pettibone Mulliken Corporation, 4700 West Division St., Chicago 51, Ill. This 36 page catalog includes the products of Pettibone Mulliken Corp. and its subsidiaries, George Haiss Mfg. Co., Inc., Universal Engineering Corp., and Hammermills, Inc. These products, many of which are illustrated and described, include front end loaders, road graders, bucket loaders, snow loaders, portable and stationary crushing, screening and washing plants, buckets, yard cranes, asphalt plants, and car unloaders and conveyors.

Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn. A 4-page catalog illustrating and describing jaw and roll crushers, feeders, conveyors, screens, crushing and screening plants, and a portable central mix asphalt plant.

Rogers Brothers Corporation, Albion, Pa. This 4-page catalog illustrates and describes the Rogers line of trailers in capacities 15, 25, 30, 35, 40, 50, 60 and 70 tons. Construction details are pictured and described.

Salem Tool Co., South Ellsworth Ave., Salem, Ohio. Descriptive matter, illustrations and specifications for McCarthy horizontal and vertical drills, rock and earth boring trench machine, and Salem augers, auger heads, cutting bits and tools, are contained in this 4-page catalog.

Sauerman Bros., Inc., 594 S. Clinton St., Chicago 7, Ill. A 2-page catalog sheet on power scrapers and cableways; contains illustrations and descriptive matter on power drag scrapers, tower machines and slackline and tautline cableways.

Seaman Motors, Inc., 261 North 25th St., Milwaukee, Wis. Seaman mixers for use in bituminous, soil cement, stabilized soil or gravel construction are pictured and described in this 2-page catalog sheet.

Service Supply Corporation, 2020 Erie Ave., Philadelphia, Pa. The Lodover tractor shovel is featured in a 1-page catalog sheet. General dimensions and weights

are given as well as a list of optional equipment.

Hose Accessories Co., 2716 North 17th St., Philadelphia 32, Pa. Le-Hi high and low pressure hose couplings are pictured and described in this 1-page catalog sheet.

Servicised Products Corp., 6051 W. 65th St., Chicago 38, Ill. Pavement joint fillers are featured in this 2-page catalog sheet. Included are descriptions and illustrations of Para-Plastic, Kork-Pak, asphalt, cork expansion and self-expanding cork premolded joint fillers.

Schramm, Inc., West Chester, Pa. Descriptive matter, illustrations and specifications of various models of pneumapower compressors, unistage engine driven air compressors, and the Pneumatractor compressors are contained in this 4-page catalog. One page is devoted to construction tools available for the compressors.

Stow Manufacturing Co., Binghamton, N. Y. This 8-page catalog covering Stow vibrators and screeds includes descriptions and illustrations of six models of vibrators. A page is devoted to flexible shafts and vibrator heads. Another page illustrates and describes accessories and a third page covers Stow vibrating screeds.

Super-Compactors, Inc., 518 Ninth St., Sacramento 14, Calif. Illustrations, descriptions and operating specifications for three models of compactors are given in this 4-page catalog.

Symons Clamp & Manufacturing Co., 4249 Diversey Ave., Chicago 39, Ill. Symons system of wall forms is featured in this 4-page catalog. Components, assembly and adaptability of the forms are illustrated and described.

Talbert Construction Equipment Co., 7950 West 47th St., Lyons, Ill. Removable gooseneck low-bed trailers are illustrated and described in this 2-page catalog sheet.

Tampo Manufacturing Co., P. O. Box 2340, San Antonio 6, Texas. Descriptive matter, illustrations and specifications on two models of pneumatic tired rollers are included in this 2-page catalog sheet. Illustrations also are shown of tandem 5-8 ton roller and a sheepsfoot roller.

Tarrant Mfg. Co., P. O. Box 358, Saratoga Springs, N. Y. Aggregate and material dryer, tar and asphalt pots, buckets, dippers, chemical spreader and a sprayer are illustrated and described in this 2-page catalog sheet.

G. H. Tennant Company, 2578 N. 2nd St., Minneapolis 11, Minn. The Tennant joint cleaning and pavement grooving machine is featured in this 2-page catalog sheet. What it is and what it does is told and illustrations of its typical uses are shown. Specifications are given.

Thermoid Company, Trenton, N. J. This 4-page catalog features Thermoid industrial brake lining, clutch facings and discs, brake blocks, and rubber products such as fan belts, neoprene hose, and truck splash flaps. Illustrations and descriptions of the various products are included.

The Thurman Machine Co., 156 North Fifth St., Columbus, Ohio. This 2-page catalog sheet is devoted to products of the Scale Division. Illustrated and described are pit scale, wheelbarrow scale, utility scale, portable truck scale, batcher scale and a liquid scale.

The Timken Roller Bearing Co., Canton 6, Ohio. Design features and advantages of the Timken tapered roller bearing are described in this 2-page catalog sheet. Types of bearings generally used in construction equipment are de-

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ROADS AND STREETS

22 WEST MAPLE STREET

CHICAGO 10, ILLINOIS

On the reverse side of this sheet is an opportunity for you to get **quickly, efficiently and economically** all the information you may need about:

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Chicago 10, Illinois

scribed. One page is devoted to Timken rock bits.

Tuthill Spring Co., 760 Polk St., Chicago 7, Ill. Descriptive matter and specifications for Tuthill safety hyway guard are included in this 2-page catalog sheet. Illustrations of guard rail installations are shown and a description is given of the Tuthill No. 4 bracket with standard guard rail.

Transport Trailers, Inc., Cedar Rapids, Iowa. Seven models of trailers are illustrated in this 2-page catalog sheet and brief descriptions given of each model. Capacities of the models range from a 6-ton model to a 75-ton model.

Tri-Line Company, 921-931 Carroll St., Racine, Wis. Descriptive matter, illustrations and specifications for the Tri-Line concrete cutter are given in this 4-page catalog.

Vibro-Plus Products, Inc., 54-11 Queens Boulevard, Woodside, L. I., N. Y. This 6-page catalog features rollgear gasoline, electric and pneumatic vibrators, Terrapac soil compactors and Topdog electric external or form vibrators. Illustrations and descriptions of the various types of vibrators are given.

Vulcan Tool Manufacturing Co., Quincy, Mass. Illustrations and sizes of 17 Vulcan paving breaker tools are given in this 2-page catalog sheet. Included also are illustrations and sizes of two detachable bit rods.

Waterloo Foundry Co., Inc., Waterloo, Iowa. The Raincap for covering tractor exhaust pipe or muffler is illustrated and described in this 2-page catalog sheet. A price list for various makes of tractors and trucks and construction equipment is included.

Waukesha Motor Co., Waukesha, Wis. Nine models of diesel engines are illustrated and described in this 4-page catalog. A table shows the power unit horsepower for Waukesha diesel industrial units, gasoline industrial units, and LPG or natural gas units.

The Wellman Engineering Co., 7000 Central Ave., Cleveland 4, Ohio. This 8-page catalog contains descriptive matter, illustrations and specifications on multiple rope buckets, power arm buckets, multiple rope rehandler buckets, power arm rehandler buckets, single line "hook-on" buckets, dragline buckets and wood and stone grabs.

Wico Electric Company, 120 Phelon Ave., West Springfield, Mass. Four models of Wico magnetos are illustrated and described in this 2-page catalog sheet. A listing is given of Wico model numbers for some of the popular applications.

Wilshire Power Sweeper Co., 526 West Chevy Chase, Glendale 4, Calif. This 2-page catalog sheet contains illustrations, descriptions and specifications for the Model 1000-M power sweeper, designed for heavy sweeping, and the Model 800 power sweeper.

Winter-Weiss Co., 2201 Blake St., Denver 2, Colo. Four models of trailers are pictured and described in the 2-page catalog sheet. These models are 20-30 ton rocker beam tandem axle lowbed, 20-50 ton tandem axle lowbeds, 10-25 single axle lowbeds, and W-W tilt beds.

With the Manufacturer

Heacock New B-G Chief Engineer. Roy C. Heacock, heretofore executive engineer of engineering development for Barber-Greene Co., Aurora, Ill., has been promoted to chief engineer in charge of development and engineering phases of the company's activities.

Equipment and Material Notes

16
Light Weight Lowering Jack

A new light-weight ratchet lowering lever jack with an aluminum housing has been announced by Templeton, Kenly & Co. Known as the Simplex A1022, the jack is 10 tons in capacity, but weighs only 42 lb. The jack has a minimum height of 20½ in., a 12-in. lift and a broad toe lift with a minimum height of 2 in. The toe lifts the full rated capacity of the jack. The jack incorporates other features of the Simplex line, including drop forged and machined alloy steel operating parts, double-lever sockets, adjustable, cadmium-plated springs and links, multiple-toothed pawls, lubricated trunnion bearings and shorter fulcrum centers. Templeton, Kenly & Co., 1020 S. Central Ave., Chicago 44, Ill.

17
3½-S Mixer

A new, low cost 3½-S Dandie concrete mixer that incorporates all recent design improvement has been announced by the Kwik-Mix Co. The new unit is a tilting type, end discharge mixer and complies with AGC specifications for 3½ cu. ft. mixed material capacity plus 10%. The drum capacity for unmixed material is

New Dandie 3½-S Mixer

5½ cu. ft. According to the manufacturer, this redesigned Dandie mixer provides for high quality performance, ease of operation and long service life. It includes such features as multiple V-belt power transmission, improved design of the four mixing blades for faster cycles and more thoroughly mixed batches, an effortless tilting device that stops and holds the mixing drum in any position and a push-down tow pole that balances the mixer for easy, one-man spotting, hitching and moving. A new locking device holds the tow pole securely in its socket, prevents machine swaying while towing and permits high speed travel. Kwik-Mix Co., Port Washington, Wis.

18
Truck Mixer

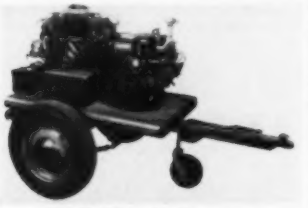
A new truck mixer model equipped with truck engine drive has been an-

New Mixer with Truck Engine Drive

nounced by The T. L. Smith Co. Because the engine on the mixer is eliminated, the deadweight of mixer is stated to be reduced by about 1,300 lbs. In this way, the manufacturer claims bigger payloads can be carried without exceeding highway weight limits. The overall length is reduced approximately 19 in. This is claimed to solve an important weight distribution problem. Considerable weight is shifted from the rear axle to the front axle, thereby enabling operators to meet stringent rear-axle load restrictions. The new truck engine drive is available in 4½, 5½ and 6½ yard sizes. The T. L. Smith Co., Milwaukee 45, Wis.

19
Portable Air Compressors

A new line of portable air compressors, announced by De Vilbiss Co., are manufactured in three sizes to deliver 21, 35 or 50 cu. ft. of air per minute. They are v-type, 4-cylinder, 2-stage compressors. The new compressors are mounted on a trailer with a standard trailer hitch for towing behind a car or truck. The compressors also can be obtained with skid mountings where great mo-



New DeVilbiss Air Compressor

bility is not required or mounting in a truck body is desired. Among the outstanding features claimed for the compressors are trouble free valves, a forged steel crankshaft, balanced and precision ground ball type main bearings and automotive insert type rod bearings. The compressors have automatic oiling to all parts. Cooling is accomplished through finned heads, cylinders and inter and after coolers. The compressors have automatic unloaders. The compressors are driven by heavy duty, industrial type gasoline engines which are air-cooled. The engines are available with either electric or magnetic engine starting systems. The De Vilbiss Co., Toledo, O.

20
Bolt Cutters

An improved line of bolt cutters, strap shears, hot line wire cutters and sheet metal hand tools is being introduced by the Interstate Drop Forge Co., which recently acquired the tool line of the Helwig Mfg. Co., St. Paul. This line is now re-appearing with heat-

Cutting Rods With Interstate Cutter

treated, drop-forged handles, plates and jaws. The use of drop forgings, in place of castings, has enabled Interstate to provide greater strength and rigidity, and to make a considerable reduction on overall weight. Because they are full-forged, side plates cannot twist. According to Interstate, the patented gear principle of achieving leverage is responsible for extreme simplicity in design. Complicated toggle mechanisms are avoided. Approximately 50% of the parts found in traditional designs are stated to be eliminated. Interstate Drop Forge Co., 4051 N. 27th St., Milwaukee, Wis.

21
Masonry Drill Bit

A new carbide tipped drill bit, announced by New England Carbide Tool Co., is designed for drilling holes ¾ in. to 5 in. in diameter in hard masonry. It is stated to easily cut through materials such as concrete with bluestone or granite aggregate and even solid granite. The bit is stated to make it possible for one man to drill holes in hard masonry without binding. New England Carbide Tool Co., Cambridge 39, Mass.

Drilling with Thunder-Core Bit

22
AC Welders

A complete new line of AC welders, announced by Metal & Thermit Corp., incorporate three highly important fea-

New A C Welder

tures, claimed to contribute to longer welder life, improved performance, and a high degree of operator acceptance. First of these features is insulation with silicone—the insulation which refuses to burn, which is proof against moisture and which is unaffected by most chemical fumes and vapors. Second feature is the combination of low open circuit voltage with arc stabilization, accomplished by incorporating capacitors in the secondary circuit to provide an extra surge of current if the arc starts to go out. Third feature is automatic hot-start which makes arc striking easy by providing just the right amount of current boost to start the arc at any current setting without manual adjustment. The new welder line is made in 200, 300, 400 and 500 amp. ratings. Metal & Thermit Corporation, 100 East 42nd St., New York 17, N. Y.

23
Crushing and Screening Plant

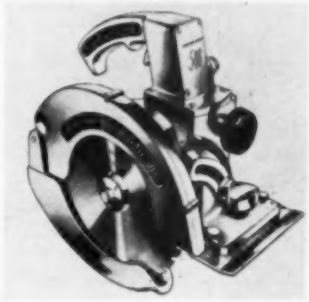
A new crushing and screening plant has been designed and built for the U.S. Armed Services by Pioneer Engineering Works. The new plant, known as the Model 33R Triplex crushing and screening plant, is designed for crushing and screening gravel and rock for use on air fields and military roads. When the specifications for the plant were set up by the Government, designers had to devise a machine which could be put into operation upon arrival at the site with the use of hand tools, only. The crushing and screening plant being made for the armed services is a completely self-contained plant of 50 tons per hour capacity. No crane or auxiliary equipment was allowed in its handling. All conveyors and auxiliary equipment are mounted on the main plant units. The triplex plant can be placed in operating position, conveyors positioned, etc., with the use of hand tools and plant mounted winches and hydraulic rams. Auxiliary cranes and jacks are not necessary although they may be used if available. The plant is returned to traveling position with the same

Model 33R Triplex Crushing and Screening Plant

equipment ready for the move to the next crushing and screening site. Pioneer Engineering Works, Inc., Minneapolis 13, Minn.

24
Electric Saw

A new electric saw developed by Porter-Cable Machine Co. features a kickproof clutch. When the blade binds in a cut or strikes a knot, this kickproof or friction clutch allows the motor to turn while the blade remains stationary. This action is stated to eliminate all possibility of dangerous kickback. The new saws are equipped with an instant depth adjustment which can be set accurately in a few seconds. The saw moves up and down on dovetail ways which are precision machined to maintain accuracy of cut at any depth. The saws are also equipped with an improved safety guard which covers more blade and tooth area. Porter-Cable Machine Co., Dept. PR-5, Syracuse 8, N. Y.



Speedmatic Saw

25
Temporary Street Markings

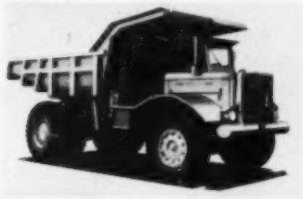
The use of pressure-sensitive tape for temporary street markings, is helping to "minimize congestion and speed up through traffic" in the business district of Elmhurst, Ill. The tape—water-resistant "Scotch" brand paper masking tape No. 202—is being used to mark test-pattern traffic lanes, cross-walks, and left-turn areas prior to the painting of permanent stripes. Initially used in conjunction with a recent one-way street improvement, the tape was applied over a 2½ block area to test the effect of proposed new markings on the flow of pedestrian and vehicle traffic. Advantages reported by a member of the village's city council, were: (1) The tape was applied in a matter of minutes without disrupting the normal traffic flow; (2) traffic passing over the tape helped press it more firmly to the pavement; (3) maintenance crews were able to make on-the-spot alterations to further smooth-out the flow of traffic; (4) weather had little effect on the tape

Temporary Street Marking at Elmhurst, Ill.

following its application to dry street surfaces; (5) the markings retained their usefulness for about a week's time; and (6) the cost, including labor, was approximately $15. The tape is made by Minnesota Mining and Manufacturing Co., 900 Fouquier St., St. Paul 6, Minn.

26
Heavy Duty Truck

A new heavy duty, end dump Earth-Mover Model 801 truck is now in full scale production by Kenworth Motor Truck Corporation. Payload capacity of the truck is 30,000 lb. and it is over-tired for safety, flotation and high tire life. The truck's body capacity, struck measure, is 9.9 cu. yds., with heaped load at 11.9 cu. yds. The truck has a full

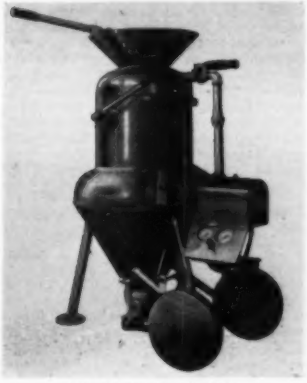


Earth-Mover Model 801 Truck

anti-friction bearing mounted, power assisted steering gear, simplified controls, minimum turning radius and wide axle track to insure ease of handling, maximum maneuverability and high stability. The offset cab of the Kenworth Earth-Mover provides exceptional visibility for the driver, both fore and aft. Special consideration has been given to simplicity and ease of access for periodic servicing and maintenance. Kenworth Motor Corporation, Seattle, Wash.

27
Cement Gun

A new machine, the Blastcrete, announced by Blastcrete Equipment Co., is designed to handle a wide variety of materials, including cement, sand, light weight aggregates, refractories, light gravels and other sandy or granular or powdery materials. The operator has complete control of air pressure and material volume and all adjustments can be regulated while the machine is in operation. It is stated that due to the



The Blastcrete Machine

efficient design of the agitating and material metering mechanisms, a very small amount of air is required for this purpose, thus permitting the use of smaller capacity air compressors. In the Machine, practically all wearing parts have been eliminated with the exception of the motor and gear reducer and these parts only require periodical lubrication. Available in three sizes. Blastcrete Equipment Co., 11152 Santa Monica Blvd., Los Angeles 25, Calif.

28
Nozzle for Brush Spraying

A fog spray nozzle made especially to apply dormant oil base sprays to brush has been developed by Bete Fog Nozzle Inc. The manufacturer claims the new nozzle effects important savings in material and labor. The nozzle, called

Fog Nozzle for Spraying Brush

the HX5, disperses a flat fan pattern of infinite-sized fog droplets in an accurately controlled 10° to 20° spray fan. There are no wasteful side horns or jets. The HX5 nozzle is lightweight, inexpensive, and designed for easy one-man operation. The atomizing elements of the Bete HX5 nozzle are a series of special narrow angle fan spray discs. A 3-foot extension with bent applicator makes it easy to apply a horizontal sheet of spray near the base of the brush. The trigger action shut-off further prevents waste by providing a positive control of the spray flow. Bete Fog Nozzle Inc., 85 Pierce St., Greenfield, Mass.

29
Contractor's Conveyor

A new conveyor engineered primarily for handling concrete and mortar has been announced by American Conveyor Co. The belt, trough, baffle plate, hoppers, and the series of scrapers are claimed to be so designed that there is no separation of concrete or mortar

Con-Vey-It Special Conveyor

nor fouling of moving parts. This conveyor as mounted on the Cub or Super A tractors is much more versatile in its applications than the company's previous contractor's conveyor, but it is not altered except in the mounting and application of hydraulic power from the tractor instead of the air-cooled engines and electric motors which we were previously using. American Conveyor Co., 1115 West Adams St., Chicago 7, Ill.

MANUFACTURERS' LITERATURE

30
Record Retention and Destruction

"A Basic Plan for Record Retention and Destruction" is the subject of a new brochure released by Remington Rand Inc. to aid management in the intelligent planning for disposition of records at the time they are created by destruction of useless records and the economical, safe storage of those that must be retained. Profusely illustrated, with actual reproductions of various forms used for record retention and destruction, the handbook contains a checking chart listing the various types of records, and the time element for their retention. Remington Rand Inc., 315 Fourth Ave., New York 10, N.Y.

31
Heavy Duty Transmissions

The first issue of "Transmission Topics", a new magazine type house organ designed to cover on-and-off highway and industrial users of heavy-duty transmissions has been published by Fuller Manufacturing Co. With on-the-job illustrations, the issue covers a variety of Fuller users in heavy-hauling, contracting, logging, petroleum, mining and other fields. Fuller Manufacturing Co., Kalamazoo 13F, Mich.

32
Hoist

The unit hydraulically operated utility hoist is illustrated and described in a circular. This product can be changed from a shop hoist to a truck hoist in a matter of seconds. Outstanding features of the hoist are described and specifications are given. Unit Manufacturing Co., 1229 Harmon Place, Minneapolis 3, Minn.

33
Traffic Control

Three bulletins are available from General Electric Co., on traffic control. Bulletin GEA-5481 covers the Type F controllers for traffic signals. This controller is universally applicable in the field of pre-timed traffic control, inter-connected or non-interconnected. Bulletin GEA-5000 covers the Type DH traffic signal controllers, which are easily adapted to most traffic control needs of the small town, the average sized city or the metropolis. Bulletin GEC-698 illustrates and describes adjustable traffic signals. Each sectional units is complete in itself. It can be used alone as a one-color, one-way signal, or two or more sections can be grouped into complete signal faces for orientation in two, three, four or more directions. General Electric Co., Schenectady 5, N.Y.

34
Estimating Book for Earth Moving

The Euclid Road Machinery Co. has published a revised and enlarged edition of an estimating book that has been widely used by engineers and estimators for many years. Entitled "Estimating Production and Costs of Material Movement with Euclids," the book is attractively printed in two colors and contains many useful charts, illustrations, formulas and reference tables. Although the book is intended for use in making production and cost estimates for Euclid earth moving equipment, the estimating methods and formulas can also be applied to equipment of other makes. Part 1 covers job analysis and the method of estimating production and the number of hauling units required for a specific job. The next section deals with cost estimating which includes the hourly cost of ownership and the cost of operation and maintenance. Samples of two very useful work sheets that are also available from Euclid are shown in this section. Part 3 contains formulas to determine grade ability, rim pull engine torque, etc., and several pages of tables with commonly used dimensions, weights and other data. The Euclid Road Machinery Co., Cleveland 17, Ohio.

35
Tarpaulins

A 4-page circular on FlameZel tarps and windbreaks contains blow torch tests demonstrating the fire resistant qualities of the products. Flame-Zel is claimed to be the finest durable finish on the market for tarpaulins. It is stated that it does not wash out and retains its fire resistant characteristics even after lengthy periods of exposure. The circular also contains information on Rain-Zel tarpaulins and windbreaks. H. Wenzel Tent & Duck Co., 1035 Hickory St., St. Louis, Mo.

36
Hole Diggers

Equipment for digging holes for foundations, piers, piling and electric pole lines and for coring and exploration work are illustrated and described in Bulletin 151 issued by Hugh B. Williams Manufacturing Co. This equipment digs holes 8 in. through 84 in. and to depths of 65 ft. It is stated that a hole 8 ft. deep and 18 in. in diameter can be dug in one minute or less in common earth. Mechanical specifications and dimension tables are included in the bulletin. Hugh B. Williams Manufacturing Co., 2946 Oak Lane, Dallas, Tex.

37
Parking Meters

Two new bulletins covering the latest features and advances available in Dual gearshift automatic parking meters have been announced by The Dual Parking Meter Co. Bulletin DU-521 covers meters designed for on-street parking control, while Bulletin DU-522 deals with meters developed especially for off-street parking facilities. An effort has been made to make these new bulletins instructive and helpful to municipal officials. For instance the off-street bulletin, No. DU-522, included pertinent information on parking lot legislation, financing, site selection and acquisition, lot layout, parking fees and time limits. In addition, the bulletin pictures typical successful lots of various types and sizes. The Dual Parking Meter Co., Canton 2, Ohio.

38
Chemical Brush Control

A new booklet, issued by Thompson Chemicals Corp., contains information on what chemicals to use, recommended dilution and methods of operation for both foliage spray and basal bark treatment. Thompson Chemicals Corp., St. Louis 3, Mo.

39
Tractor Attachments

A new 32-page catalog (Form 30182) shows many possibilities of adapting Caterpillar diesel tractors to specific jobs. The fully-indexed catalog explains uses and construction of each tractor attachment. Thirty action pictures supplement the catalog views. Specifications, drawings and dimensions are provided where needed. Included are such practical and low-cost items as cab heaters, rain traps and air prescreeners. Sizes of the attachments range upward to the steel cabs available with four models of tractors.

40
Diesel Crawler Tractor

The International TD-18A diesel crawler tractor is illustrated and described in a comprehensive 24 page catalog. This tractor has a drawbar horsepower of 87 and is available in two gauge widths, 62 in. and 74 in. A typical operating weight of the 74 in. gauge tractor with fuel, water, guards and starter is 24,500 lbs. Various features of the tractor, such as the power plant, lubrication system, cooling system, main and track frames, and stabilized track system, etc., are pictured and described. Illustrations show the tractor on many construction operations. Specifications are included in the catalog. International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

41
Coatings for Plant Maintenance

A new 4-page bulletin describing a dozen different special coatings for plant maintenance, issued by United Laboratories, Inc., describes the use of various industrial products for skidproofing, painting over damp areas, weatherproofing and decoration of exterior masonry, interior waterproofing and other maintenance work. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, O.

42
Soil Compaction

"Cost Data for Soil Compaction in Restricted Areas" is the title of an interesting, new technical bulletin which has been prepared for contractors and construction engineers by Barco Manufacturing Co., maker of the Barco portable gasoline rammer. The cost figures are based on a survey of actual jobs and are intended to be helpful to contractors in preparing bids and maintaining cost records. In addition to covering direct cost items such as depreciation, interest, insurance, taxes, fuel and repairs, the bulletin discusses overhead charges and possible variations in conditions on various jobs. Barco Manufacturing Co., 1801 Winnemac Ave., Chicago 40, Ill.

43
V-Drives

A guide for quickly and accurately making V-drive selections has been issued by Fort Worth Steel and Machinery Co. Simple formulas for standard quarter-turn and V-flat drives are augmented by tables of drives in all belt sections which have been compiled for quick selection of drives of required ratio and speed. The bulletin also contains engineering information on other types of V-belt drives. Fort Worth Steel & Machinery Co., P.O. Box 1038, Fort Worth, Tex.

44
How Unusual Survey Problems Were Solved

"The Surveyor's Notebook," a collection of short articles on unusual surveying problems and their solutions, has been published by W. & L. E. Gurley. The first page in "The Surveyor's Notebook" tells how one surveyor helped lay an oil pipeline in record time by using a few "tricks of the trade". In another, a county surveyor from Nebraska gives his method for quickly determining a quarter-section line when it is completely blocked by railroad cars. One story explains how a Commonwealth of Massachusetts survey party used captive pilot balloons to get initial lines between stakes separated by heavy timber, while others outline ways to improve land survey records and the advantages of a solar transit. Among the surveying tips are a remedy for "frozen" tripods and a method for leveling over 10 feet of corn. Unusual stories in the collection include the problems of surveying in the Arctic; unique transit practices of the Corps of Engineers in obtaining the first accurate survey of the Niagara River bed; use of transits and levels inside an aircraft plant; and how transits measured movement of a bell tower. W. & L. E. Gurley, Union Plaza, Troy, N.Y.

45
Welding Materials

A new catalog, issued by Rankin Manufacturing Co., contains specific information on recommended application procedures, rod selections, amperages, speed, heat control and proper rod grip for hardsurfacing with Ranite materials. Sizes, characteristics, quality, suggested applications and Rockwell hardness of the complete Ranite line are included in the catalog. Rankin Manufacturing Co., 3072 West Pico Blvd., Los Angeles 6, Calif.

46
Bin Level Indicators

A new catalog describing and illustrating its line of bin level indicators, issued by The Bin-Dictator Co., contains complete installation data for the various types of units: for thin or thick walled bins, for inside or outside locations, and for suspended interior installations. Wiring diagrams are included, making the book a useful reference manual for installation and maintenance crews. The catalog also describes the Bin-Flo aerator unit, which is used to introduce low-pressure air into dry, finely ground materials which tend to pack and bridge. The Bin-Dicator Co., 13946-59 Kercheval, Detroit 15, Mich.

47
Cranes, Hoists, Material Elevators

A new general catalog issued by American Hoist & Derrick Co., covers all its equipment from the giant revolver cranes, through the extensive line of locomotive cranes, hoists, material elevators, car pullers right down to the famous Crosby wire rope clips. The catalog contains actual "on the job" pictures. American Hoist & Derrick Co., 63 S. Robert St., St. Paul 1, Minn.

48
Auxiliary Electric Power

A new folder describes the types and sizes of Onan electric plants for public utility needs. The folder tells how utility companies can be served by Onan electric generating plants. Full information and specifications are given for plants from 400 to 5000 watt sizes in both AC and DC models. D. W. Onan & Sons, Inc., University Ave. S.E., Minneapolis 14, Minn.

49
Transmissions and Auxiliaries

Condensed specifications on the entire line of Fuller heavy-duty transmissions and auxiliaries are contained in a new booklet. Reference data includes number of speeds, type of mounting, whether truck or industrial application or both, gear ratios in which direct and overdrive occure, specific gear ratios, approximate engine size, installation directions, weight, location of control, clutch housing size, oil capacity, location of power take-off opening, and relative speed of PTO to input rpm. Cutaway illustrations of the major types and sizes of both unit transmissions and auxiliaries are shown. Fuller Manufacturing Co., Kalamazoo, Mich.

50
Sod Cutter

What the Phillips power sod cutter can do is explained in a circular. This cutter is a compact, self-propelled one-man machine, stated to be capable of cutting from 1 to 1½ acres of sod per day. The 8 hp Briggs & Stratton gasoline engine moves the machine at a natural walking pace. The machine weighs about 700 lb. The cutting blade is of high carbon steel and is readily removable. Cut sod is 16 in. wide and the blocker automatically cuts off the sod at any predetermined length. Phillips Power Sod Cutter, 619 S. 15th St., Lafayette, Ind.

51
Traffic Signs

A new, revised, three color descriptive bulletin illustrating and describing reflectorized and plain traffic signs has been published by the Cataphote Corporation. Four types of reflectorized signs are shown including reflector button, bead, sheeting, and silver reflecting panel. Other types include embossed and plain lettering, with copy suitable for all parking, turning and school installations. Also included are street name signs, and posts and accessories. Cataphote Corporation, Toledo 10, O.

52
All-Wheel-Drive

The Marmon-Herrington all-wheel-drive Fords are illustrated and described in two circulars. One covers the "Q" series, the other covers medium duty and light duty trucks. Exclusive Marmon-Herrington features designed and engineered exclusively for Fords are pictured and described. Outstanding features of all models are described. Marmon-Herrington Co., Inc., 1511 West Washington St., Indianapolis 7, Ind.

WITH THE MANUFACTURERS & DISTRIBUTORS

Snow Promoted by Aeroquip—Byron E. Snow for the past two years sales engineer in the Chicago area for Aeroquip Corporation, Jackson, Mich., has been appointed manager of the new Chicago office, 1033 South Boulevard, Oak Park, Ill.

Snyder Joins Cummins Dealership Organization — Raymond H. Snyder, former president and treasurer, Snyder Aircraft Division, Air Associates, Chicago, has purchased certain assets of the Chicago operation of Cummins Diesel Sales Corporation, and will operate the Chicago facilities as an independently owned Cummins Dealership with the new company name of Cummins Illinois Engine Sales, Inc. Headquarters will remain at 1700 South Indiana Ave., Chicago.

Marion Opens New Parts Warehouse. Marion Power Shovel Co., Marion, O., has opened a new parts warehouse to serve Arizona, Utah, Nevada and western New Mexico. Office and warehouse are at 1017 North 22nd Ave., Phoenix, Ariz.

Appointed Divisional Sales Engineer. Arthur Templeton, formerly sales engineer in Chicago area, has been appointed southwestern divisional sales engineer for Templeton, Kenly & Co., Chicago, Ill., with headquarters at 6505 Aberdeen Ave., Dallas, Tex. He will cover Texas, Oklahoma and Louisiana.

Worthington Promotions. C. K. Hood, formerly manager of the New York district sales office of Worthington Pump and Machinery Corporation, Harrison, N. J., has been elected vice president in charge of sales. Other Worthington Promotions effective April 1: W. J. Van Vleck, present manager of the corporation's Atlanta District Sales Office, succeeds Mr. Hood as manager of the New York District Sales Office. C. W. Kramer, resident general line salesman in Birmingham, Ala., succeeds Mr. Van Vleck as manager of the Atlanta office. I. W. Leggett, general line salesman at Charlotte, N. C., has been appointed manager of the Charlotte Branch Office.

Levison Promoted by Blaw-Knox. Arthur A. Levison, heretofore division vice president in charge of the construction equipment department of Blaw-Knox, Division 7, Blaw-Knox Co., Pittsburgh, Pa., has been appointed vice president and general sales manager of the division. In this position he will administer the sales and engineering functions for all departments of the division.

Taylor Promoted by Universal Atlas. James E. Taylor, assistant district sales manager of Illinois-Wisconsin territory of Universal Atlas Cement Co., has been appointed district sales manager of the same territory with office in Chicago. He succeeds Charles L. Peyton, who retired Feb. 29.

Spoor Appointed Manager. Dale D. Spoor, former chief of the Industrial Branch of the Metalworking Equipment Division of NPA, has returned to Air Reduction Co., New York, N. Y., and has been appointed manager of Auco's Equipment and Process Sales Department.

Shunk Promotes Newkirk. J. D. Newkirk, associated with Shunk Manufacturing Co., Bucyrus, O., for nearly three years in a direct sales capacity, has been appointed general sales manager. He succeeds J. Austin Carrington, who resigned in January to become affiliated with an enterprise in Indianapolis.

New Hough Representative. Carl W. Tuohey has been appointed representative of The Frank G. Hough Co., Libertyville, Ill., for Hough sales district 2, comprising the states of New York, New Jersey, Pennsylvania, Delaware, Virginia, West Virginia and New England. He succeeds William Cornell who was recalled to active service with the Marines.

Named Gradall Sales Manager. Irwin T. White, heretofore sales engineer in the Detroit district office, has been appointed sales manager of the Gradall Division of Warner & Swasey Co., Cleveland, O. Robert L. Groves, presently sales engineer in Grand Rapids, succeeds Mr. White at Detroit.

New Lima Distributor. The Lakeshore Machinery & Supply Co., 400 West Laketon Ave., Muskegon, Mich., has been appointed distributor for Lima shovels, cranes and draglines in the western half of the lower peninsula of Michigan.

Butler Joins Timber Engineering. Edwin R. Butler, veteran journalist and

advertising man in the lumber industry, has joined the staff of Timber Engineering Co., Washington, D. C., as manager of its publicity department.

New Cleaver-Brooks Representatives. Cleaver-Brooks Co., Milwaukee, Wis., has announced the appointment of the following manufacturer's representatives for the sale of its boiler equipment: Wilson-Weesner-Wilkinson Co., 310 South 2nd St., Nashville 6, Tenn. for 37 counties in Tennessee and 26 counties in Kentucky. E. C. Giberson, 3719 Center St., Des Moines, Ia., for 29 counties in Iowa, four in Missouri and one in Illinois.

Appointed Sales Engineer. James A. McCrae has been appointed sales and service engineer for Baldwin-Lima-Hamilton Corporation, Lima-Hamilton Division, Lima, O. His territory will include the states of Colorado and Wyoming with the exception of the following counties in Wyoming: Sweetwater, Uinta, Lincoln, Sublette and Teton. He will have his headquarters at 1410 Eaton St., Denver, Colo.

California's Epic Storm

(*Continued from page 70*)

drifts deposited by the wind on Donner Grade.

At this point the road drops 1200 ft. in slightly over 3 miles. Rotary plows went to work on snow drifts 16 to 20 ft. in depth. Attempts to use bulldozer equipment to break the snow down to the rotary, as is done on roads which have remained closed all winter, were unsuccessful, as the drifts were not sufficiently consolidated to support such equipment.

Used 2-Man Saw

During the early stages it was found possible to use a 7-ft. 2-man crosscut saw with one handle removed, to slice down through the snow and establish cleavage lines. The blocks so formed fell into the roadway as they were undercut by the rotary plows. This operation is shown in one of the accompanying pictures.

Later as the snow became more consolidated, it was necessary to use powder to loosen the pack ahead of the plows. For this operation two holes, one over the approximate center of each lane, were punched down to within a foot of the pavement. Each was loaded with from 12 to 18 sticks of 20% powder. Care was taken not to overload so as to produce a loud report, as much of the work was done under massive overhanging slopes of snow and there was a possibility that sound vibrations might cause a snow avalanche. These pairs of holes were spaced at 6-ft. intervals along the road, but it was found that the most progress was made by firing a round and then clearing out the shattered face before the next round was loaded and fired.

Rescue Plow Followed

Generally, only one plow could be used on each face due to the need for maneuvering space for work and for escape in case of a slide. When equipment was worked under threatening slopes, a second auger plow was worked nearby, generally on widening, so that it could be quickly summoned to dig out the leading plow if it became buried. Reduction of overhanging slopes following the break-through presented a problem, as some faces were 20 to 30 ft. high. Shop mechanics rigged reinforced cutting blades as extensions on the mold boards of motor graders and these rigs were used to backslope high banks.

Some of the slopes on the east side of Donner Summit were brought down by undercutting with a wire cable carried across the upper side of the slope and looped back along the road. One end was fixed to a heavy truck, which served as a dead man. The other end was attached to a truck or grader, which traveled along the road and drew the cable through the snow, thus forming a slip plane.

Opening operations, including blasting ahead of the plows, were carried

on 24 hours a day during favorable weather. It was necessary to suspend operations for 2 days during a warm rain which fell between the 6000 and 7000-ft. elevation—an exceptional condition for January. Fortunately, cold weather followed and as a result no major snow avalanches were experienced. Operations insofar as possible were on a 24-hour basis. Many men, especially equipment operators, mechanics and foremen, were forced at times by circumstances to work many hours more than the 12-hour shift, which is the standard shift time during snow removal operations.

It was possible to put into service extra auger type plows. These plows were utilized first for the purpose of cutting roads to snow-bound communities on State highways throughout the strickened area. They were later shifted to widening and cleanup work.

Some idea of the cost of the January storm may be gained from the figures tabulated.

January Snow Removal Cost

	1951	1952
District II	$ 87,238	$298,279
District III	76,248	193,075
District IX	18,843	74,268
District X	13,815	39,968
	$196,144	$605,586

The districts listed embrace the north and central mountain area affected by the storm. The cost figures shown for District III include, in addition to roads in Superintendent T. T. Buell's territory, such roads as Echo Summit, Yuba Pass, and several foothill connections.

District III personnel is under the direction of C. H. Whitmore, District Engineer. P. R. Lowden is Operations Engineer, and R. I. Nicholson is Maintenance Engineer. Foremen working under the direction of Superintendent Buell are J. L. Snider, Yuba Gap; J. J. Lloyd, Donner Summit; M. K. Fuday, Truckee; and A. C. Sangster, Tahoe City.

Navy Jet Airfield Pavement Seminar

(*Continued from page* 66)

crete will stand up under severe heat, Anderson told about the base of a V2 rocket launching platform at the Coco military base in Florida. Concrete aggregates in the slab paving were composed of a quartz beach sand with calcium carbonate cementation, and after many V2 launchings the slab showed only a minor sandblast effect.

J. M. Griffith, Engineer of Research for The Asphalt Institute, agreed that modern advances in aircraft had revolutionized concepts of asphaltic concrete design, but he warned that reports of blast damage to AC areas were being exaggerated.

"Actually, the damage is confined to relatively small areas: test aprons and the ends of runways. The problem here can be solved by designing special pavements which will stand up under test heat and blast."

Griffith said that asphaltic concrete pavements can now be designed to stand up under high-pressure aircraft tires, and even fuel spillage is no particular problem, he said, where asphaltic concrete pavements have been designed for a dense, instead of a porous, surface.

The Asphalt Institute expert pointed out that there was very little if any fuel spillage on aircraft carriers because of the fire hazard, and he asked delegates why there should be such excessive fuel spillage in the U.S. Air Force operations. Better housekeeping around fueling areas, he said, would do much to minimize that problem.

Griffith urged the delegates to give serious consideration to rubber tire rolling of asphaltic concrete pave-

ments, especially in fueling areas, to develop an impermeable texture and reduce voids. He recommended that the pneumatic rolling be done after steel wheeling, and while the pavement is still about 150 degrees hot. Steel wheel rolling should be done just as soon as it is possible, he said.

A recent inspection of the San Diego Naval Air Station, El Toro, Whiting Naval Air Station, Alameda, Drummond, and Cherry Point stations had failed to disclose severe damage, he said. There was some bad erosion at Alameda, but investigation revealed that the pavement was a cold mix surfacing and was particularly vulnerable.

The Future: Big Question Mark

If any of the airfield engineers regarded the future with any degree of complacency, their aplomb was rudely shattered by Fred A. Payne from the Chief Engineer's office of North American Aviation, Inc., Los Angeles. In 15 minutes Payne hammered home a simmered-down course in areonautical engineering which caused some delegates to gasp in amazement.

"In case anybody is interested," Payne said, "what we're after in military aviation is plane performance, and airfield pavements must be improved to keep pace with aeronautical developments."

Payne told how flight power varies roughly with the cube of speed, and that there are now no fundamental limits in speed and altitude. Aviation is on the threshold of a tremendous performance increase, he said, and in the near future the engineers can expect tailpipe velocities of 3000 fps and temperatures of 3500 deg. F and over, giving pavement temperatures as high as 1600 deg. and blast velocities over 1000 fps.

Payne told how duraluminum is on its way out for high-

performance airplanes, and predicted that steel or titanium would have to be adopted to stand skin temperatures of 500 degrees and over in the hypersonic speed ranges. Aerodynamic properties of high speed wings will probably cause tailpipe impingement angles as sharp as 20 deg. very soon, and planes will likely use rocket assisted takeoff units as well as some type of parachute drag in landing. Fuel storage and handling, especially of liquid oxygen and some of the other rocket fuels, will become a growing problem.

Landing and takeoff speeds can be expected to increase up to 250 knots, Payne said, and he let the engineers draw their own conclusions about the drainage facilities and pavement smoothness for that velocity in ground operation.

Moroccan Air Strips

(*Continued from page* 61)

Incidentally, rolling the completed asphalt pavement with a pneumatic tired compactor weighing 50 tons or more is reported to increase greatly the resistance of the pavement to damage from jet fuel spillage. Jennite, a tar emulsion compound, has been applied to refueling aprons as a means of increasing resistance. [Editor's Note: See report elsewhere in this issue on the Navy's recent airfield pavement Seminar at Port Hueneme where speakers reported similar results of rolling and densifying the pavement surface.]

The Asphalt Paving

Aggregate gradation and control have been the chief and constant problems in producing asphalt mix for the airstrips. The intention was to design a mix as close to U. S. standard practice as possible, but it became necessary to compromise in some respects with these standards in order to have the two strips ready for the "crash" program deadline. In fact, the first strips were actually built with crusher-run aggregates, working is each case from a single stockpile with only an oversize reject screen at the crusher to meet the Marshall Test for flow and stability.

The problems encountered at Nouasseur are representative. Here the hard quartzite available for coarse aggregate produced irregular gradation curves in crushing, with gaps in the intermediate sizes. No suitable natural sand was found; none is known to exist, in fact, anywhere within a radius of 75 miles of Casablanca.

Sand used for the asphalt mix was

a beach sand with a high shell content, a material very difficult to control.

Recently equipment has been installed to manufacture sand from quartzite, working out a grit from ⅝ in. down. This reduction is producing excessive minus 200-mesh material which has to be eliminated, further adding to the cost. A mix has been designed utilizing about 50 per cent quartzite crushed aggregate, 39 per cent quartzite grits, and 11 per cent fine beach sand.

At Sidi Slimane two washing plants were installed last Autumn to produce asphaltic concrete aggregates. These plants receive pit run gravel, scalp oversize, roll-crushing into two products, one being coarse aggregate suitable for other work. The finer product then is screened again into two components, and the finer material run through a sand drag to eliminate clay and silt, the material being finally blended into a product which meets good gradation practice for asphaltic concrete.

Criticism reached the U. S. public over some of the defects in the initial strips. At Nouasseur local unfinished pavement areas at the bottom of a drainage swale through an apron showed distress following ponding from incompleted drainage. This was produced by passing a 200-ton test roller over the area. This same load revealed other distressed points elsewhere over about ¼ of the apron. The surface course had not been placed for these pavements, which thus left the relatively coarse,

open binder course mix exposed to infiltration. The 200-ton roller was originally intended only for testing purposes and was expected to develop any weakness in the pavement so that corrective action could be taken.

Critics also claimed that excessive asphalt was used in the mix. The contractor's records seem to refute most of these charges. An authorized representative of the Corps of Engineers Contracting Officer is on record stating that the screens used in the asphalt plant and the percentage of asphalt used in the mix were in accordance with the design mix. Such variations as occurred were corrected as quickly as possible.

Excess asphalt may have occurred momentarily. The overall-average percentage for the Nouasseur job, representing 196,000 tons of mix up to Nov. 30 last year, was 5.863%. This agrees closely with settings specified by the Architect-Engineer, according to a statement from the Atlas Constructors. The figure averaged 5.7% for another 47,000 tons produced from November 30 through February 29 this year.

For the mix produced at Side Slimane the asphalt content averaged 5.248% for 232,000 tons to Nov. 30 and 4.9% for 40,000 tons additional placed by Feb. 29. These figures again would seem not to be out of line.

On July 28, 1951, following the Bastile day deadline, a letter from an Architect-Engineer representative stated that changes made in the method of producing hot mix aggregates had resulted in a considerable improvement in control. The mix at this time was running 4.375% asphalt, with Marshall stability at about 2,000, a satisfactory figure assuring against shoving.

In Conclusion

The question of the load carrying capacity of the two air strips is not a major one. Informal tests such as the running of a heavy International tractor over the pavement indicate high density and stability in the binder course. (The tractor grousers failed to dent the surface on a relatively cool day).

Fully controlled evaluation studies are in progress at the two fields at this writing by specialists and results are undergoing study by the architect-engineer personnel and by specialists. It is predicted that these studies will confirm the existence of some areas of non-uniformity, both in the subgrade and in the base materials. Supercompaction with a 200-ton roller over the pavement is being discussed as one of several possible means of remedying the conditions.

AN AUCTION

4 HEAVY EQUIPMENT AUCTIONS

No. 1: THURSDAY, MAY 22, 12:30 P. M., BEATRICE, NEBRASKA

2 Insley K-12 cranes, 35' booms
2 drag buckets, 1 clamshell
2 Backfill attachments
2 Rud-I-Matic taglines
Cat 30 tractor
No. 9 Cat patrol
16-S Smith mixer, complete
10-S Koehring mixer, complete
Water pumps
Water tanks
4 Insley rubber tire 9 cu. ft. carts
Air compressors
Dump trucks
2 Int. 3 ton trucks with winches
Pickup trucks
Many other pieces large and small

Every piece of equipment is in excellent condition and ready to work. The equipment is clear of all encumberance.

JAMES A. KNAPP, Owner

No. 2: MONDAY, MAY 26, 1 P. M., CATOOSA, OKLAHOMA, JUST 12 Miles NE of TULSA on U. S. Hiway 66

MODEL 4500—5½ yd. MANITOWOC DRAGLINE, 140' BOOM, HENDRIX BUCKET, 60" x 25' CRAWLERS, TWIN GM 6-71 POWER, COMPLETE WITH EXTRA PARTS, THIS MACHINE IS IN EXCELLENT, A-1 CONDITION! !

MODEL 40A 3 yd. MARION DRAGLINE, 100' BOOM, 2 BUCKETS, CUMMINS L-16-200 H.P. POWER, COMPLETE AND WITH EXTRA PARTS, THIS MACHINE IS IN EXCELLENT CONDITION! !

Cat. No. 12 patrol, cab, scarifier; TD18 & TD9 tractors with hyd. angle dozers; DDH Cletrac with Drott 2 yd. front loader; 3 I-4 Int. tract w/dozers; 20 ton lowboy A-1; 4 Model 1064 White tractors, Cummins deisel; 5-20 yd. water level bottom dump semi-trailers; 4 KR11 Int. truck tract; 4-15 ton bottom dump trailers; dump trucks; air compressors; water pumps; B-E conveyor loader; new tires and other items.

This equipment is in good condition and ready to work. The equipment is clear of encumberance.

McNABB COAL COMPANY, Owner.

No. 3: MONDAY, JUNE 2, 10 A. M., LITTLE ROCK, ARKANSAS

60 TRACTORS, TD-6's, TD-9's, TD-14's, TD-18's, TD-24, D-2's, D-4's, RD-4, D-6's, HD-7, HD-10 and HD-14; many of these tractors are complete with dozers and PCU's.

15 MOTOR GRADERS, Adams No. 51's, Adams No. 412, Adams No. 414, Adams No. 511's, Austin Western No. 99's, BD-2 A-C grader, Cat. No. 12, Cat. No. 212 and 2 Cat. pulligraders.

2 scrapers, wagon drill, air compressors, IHC power units, QUICKWAY SHOVEL, ¼ yd. mounted on tandem '46 Ford, L-41 LORAIN ¾ yd. dragline w/bucket, Cat. D-318 engine, and many other items.

Much of this equipment has been completely rebuilt. It is all free of encumberance.

LITTLE ROCK ROAD MACHINERY CO., Owner.

No. 4: WEDNESDAY, JUNE 4, 1 P. M., ELKADER, IOWA which is approximately 75 miles Northeast of Waterloo

5 D-7 Caterpillar tractors, all with DDPCU, one with Cat. dozer and one with push plate and all are in top condition.

2 Le Tourneau LS scrapers, rubber quite good; LaPlant Choate scraper Model C-108; Adams pull blade power control; sheepfoot; Cat. ripper model 18; trucks; '50 Buick sedan and other items.

All of this equipment is in excellent condition and ready to work. The equipment is all clear of encumberance.

J. T. RYAN ESTATE, Owner.

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1—TD-24 Tractor Dozer Serial TDE 2587. Bucyrus Erie Angle Dozer; also extra Isaacson Model KSF Straight Blade. $13,900.00.

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1—D8 Serial #1H8363 with 8S Caterpillar Dozer and 8R LeTourneau DDPCU.

2—D4s Serial #71-8255 and #71-9186 with Le Tourneau DDPCUs and Angledozers. Engines have 600 hours since complete overhaul. Both in excellent condition. One has new roll assemblies.

2—Cat 12 patrols 9K series each with cab—heaters—lights—scarifiers—14' moldboards. One has electric starter.

2 Cat.—Patrols, 7T series each with cab—heater—lights—electric starters—scarifiers—14' moldboards. We also have some 8, 12 and 13 ft. Chip Spreaders, Buckeye and Good Roads.

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900 PCS. SETH. SP4—39 and 45 ft.
410 and MARION 32 STEAM CRANES

STANHOPE, 99 E. 42nd St., New York 17, New York

FOR SALE

1—D-7 Caterpillar w/dozer, 4T-1649.

1—D-8 Cat. Tractor w/PCU, 8R-9051SP.

4—TD-24 Int. Tractors w/PCU, 1950.

2—TD-24 Int. Tractors w/dozers, 1950.

2—Seaman Pulvimixers, self prop., 1949.

1—Buckeye, Finegrader, pract. new, F13.

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2—Complete sets G.E. electrical equipment designed to operate above hoists and swingers. NEW—UNUSED—ORIGINAL CRATES. Each unit includes 100 HP and 20 HP motors, brakes, control switches, control panels and motor generator set for D.C. dynamic braking.

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3—D8 Caterpillar tractors w/PCU & dozer — 2 U series	10,745.00*ea.
1—D8 Caterpillar tractor w/PCU & dozer—1H series	5,000.00
4—TD24 International tractors, bare, 1500 series	10,350.00 ea.
1—D4 Cat, tractor w/ML4 Athey mobiloader	5,900.00
2—DW10 Cat. Pneu. Tractors w/PCU and Dozers.	10,600.00 ea.
2—DW10 Cat. units w/4500 gal. McCoy Sprinkler trailer	12,000.00 ea.
2—LeTourneau Super C Tournapulls w/LP scrapers	5,500.00 ea.
1—Mod. LP LeTourneau carryall	4,000.00
1—Mod. 80 Cat. scraper w/extensions—90%	10,500.00
6—Mod. 22 Gabbardt DD tamping rollers	2,700.00 ea.
1—12-ton Davenport diesel elec. locomotive, std. gauge	8,500.00
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1—365' (actual) G.D. Mod. WBH air comp. V. drive by GM diesel	6,500.00
1—576' (actual) G. D. Mod. WBU air comp. V. drive by GM diesel	10,000.00
2—105' Gardner Denver port. air comp. on 2 pneu. wheels	1,800.00 ea.
1—365' Sullivan diesel port. comp. 4 pneu. wheels	4,500.00
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4—9.7 yd. Euclid Mod. 49FD end dump Euclids—G.M. diesel	13,575.00 ea.
2—98V Euclid loaders w/blade side cutter	18,000.00 ea.
2—Mod. 12 Cat. motor patrols w/scarifier	7,750.00*ea.
1—Mod. CA154 Noble batching plant—used 6 months	22,000.00
1—Lot Blaw Knox steel cantilever forms	
1—Lot 36" conveyor equipment complete w/ frames and drives	
1—Lot Moretrench Wellpoint pumps and accessories	

Also a large inventory of Caterpillar, International, Euclid, LeTourneau and General Motors parts, as well as a wide selection of tools, pumps, transformers, supplies and mess-hall equipment.

*Items so marked will be available about June 1st—other items are now available.

All of above equipment located at Republican City, Nebraska.

THE FOLLOWING EQUIPMENT IS LOCATED ON THE WEST COAST:

4—TD24 Int. Tractors, bare, 1500 series	$10,350.00 ea.
3—D8 tractors w/PCUs and dozers	10,745.00 ea.
1—D6 Cat. w/Mod. T6 Trasscavator	7,500.00
18—20 cu. yd. Western end dump rock trucks—diesel	7,750.00 ea.
6—20 cu. yd. Sterling end dump rock trucks—diesel	5,000.00 ea.
12—16 yd. Utility end dump trailer w/Peterbilt tractor	12,700.00 ea.
3—Mod. W LeTourneau carryalls	6,000.00 ea.
1—Mod. FU LeTourneau carryall	7,500.00 ea.
1—Mod. C86 LaPlant Choate carryall	2,750.00
2—4500 gal. Western sprinkler trucks—Cummins Diesel	8,000.00 ea.
2—3000 gal. Sterling sprinkler trucks—Cummins Diesel	7,000.00 ea.
7—URM99 Gardner Denver wagon drills	1,400.00 ea.
2—G200R Chicago Pneumatic wagon drills	1,200.00 ea.
1—29T Bucyrus-Erie blast hole drill	7,700.00
5—500' C.P. port. air compressors, diesel	6,500.00 ea.
4—500' I. R. port. air compressors—oil	5,400.00 ea.
5—4 cu. yd. Dumpcrete (Mason) bodies	1,500.00 ea.
1—2 yd. Owens type DX rd. nose clam. bucket	2,000.00
1—3 yd. Owens type DX rd. nose clam. bucket	3,000.00
1—V4 Parmanco horizontal auger drill, gas	2,500.00
1—Model 58V Euclid loader—Cummins	18,000.00
1—25 ton x 95' Stiffleg derrick	7,500.00
1—9" x 9" Sullivan compressor Mod. WG9—electric	1,500.00
4—18"—12000 g.p.m. Economy pumps, electric	7,350.00 ea.
1—20 ton Pointer Williamette skyhook—1200'	20,000.00
1—Navion airplane, 100 hrs. since comp. modernization	
3—Mod. 12 Cat. motor patrols — 9K series	$5,000.00 to $7,500.00 ea.

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Serial No. 50023 — ***USED ONLY 6 WEEKS***

INCLUDES: Jackson Vibratory Tube, generator, all wheels.

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● Used Cedar Rapids Model RMP1 portable secondary rock crushing plant consisting of:

4033 hammermill, 30" reciprocating feeder, 4'x12' two-deck vibrating screen, feeder conveyor, return conveyor, rock delivery conveyor with 30' extension, detached sand delivery conveyor, Rotovator and either UD-9 International engine or electric motor driving screen and conveyors. All mounted on twelve pneumatic tired wheel truck with air brakes. Plant Ser. No. 9716.

$20,000.00

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Caterpillar #12 Motor Grader, Ser. #8T8486 with Scarifier, New, only 600 hours. Perfect Condition

Allis Chalmers HD 5G Tracto Shovel & Dozer Blade, Excellent Rebuilt Condition

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Tampo Sheepfoot Roller Double Drum, New

This Equipment is in excellent condition and can be bought at a big savings.

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1944 Diamond T 6x6 with Holmes Wrecker - 9.00x20 tires - Air Brakes.
1943 Available L.W.B. Tandem - 150 H.P. Cummins Diesel - 10.00x20 Tires - Air Brakes.
1945 White Model 1084 - Tandem - with 10 yard Dump body - 150 H.P. Cummins Diesel - 11.00x24 Tires - Air Brakes.
1938 Mack L.W.B. Tandem - 150 H.P. Cummins Diesel - 11.00x24 Tires - Air Brakes.
1945 Studebaker 6x6 tandem - with Jaeger 3 yard Concrete Mixers.
1944 Federal 7½ ton 6x6 Tandem with Garwood Swing Crane and two 1000 watt adjustable spot lights, self powered - Air Steering - Air Brakes.
1945 Chevrolet 4x4 Cargo with Tarps - A-1 condition.
1949 Fruehauf 30 foot Tandem Grain Trailer. Many other trucks and trailers to choose from, ½ to 10 ton trucks and all type trailers.

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Vandeventer Auto Sales
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ST. LOUIS, MO.
PHONE - FRANKLIN 1750

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1—24" reciprocating feeder with 5 yard ramp loading charging hopper.
1—24" x 80' lattice frame conveyor with speed reducer drive.
1—3033 hammermill with set of V-belt drives.
1—24" x 42' lattice frame return conveyor with speed reducer drives.
1—Set electric motor starter, push buttons.
1—10 h.p. 1200 r.p.m. electric motor.
1—5 h.p. 1200 r.p.m. electric motor.
1—Set of sheet metal, push button stations, 220 volt, for 5 h.p. and 10 h.p. electric motors.
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1—8' x 14', two-compartment, 50 ton steel bin.
1—Simplicity 4' x 12' screen with 10 h.p. electric motor.
1—TD 9 International tractor with Drott front end loader.
1—40,000 lb. 22' bed Fairbanks-Morse scale.

Equipment was purchased new in 1950. Sale price $75,000.

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Will attach to front end of 4-wheel drive truck.

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1 - International TD6 tractor - Hough hydraulic bucket loader - 1955.

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Skeleton trailer with flat bed. Equipped with 8 new tires and vacuum brakes. Very good for transporting high-lift equipment, bulldozers, etc. Load from rear on planks. $900.00.

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USED MOTORS—PRICED FROM $5 TO $10 PER H.P.

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H.P.	Name Brand	Voltage	R.P.M.	Price
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60	West.	220	1760	400
50	West.	220/40	1760	300
50	A. C.	220	855	400
40	West.	220	850	300
40	G.E.	220/440	880	400
35	G.E.	2300	900	300
30	A.C.	220	2900	300
30	G.E.	220	1800	300
25	G.E.	440	900	350
25	G.E. (Hoist)	220	850	350
15	West.	220	900	75
15	C.W.	220	1740	125
10	Dr. Cr. Wt.	115	1150	90
7½	GE. TEFC	220/440	3500	75
7½	Pitt. Elec.	220	1740	75
5	G.E.	220/440	3435	75
5	G.E.	220	1800	75
15	F.M.	220	1800	50

25 CYCLE USED MOTORS

H.P.	Name Brand	Voltage	RPM.
100	G.E.	2200	750
100	G.E.	220	720
75	G.E.	440	485
75	G.E.	440	720
37	G.E.	220	720
30	West.	220	715
30	G.E.	440	715
25	G.E.	440	950
25	West.	220	715
25	A.C.	220	720
25	G.E.	2200	750
15	Wagner	220	715
10	West.	220	710
7½	West.	220	715
7½	G.E.	220	715
5	West. Elec.	220	720
5	Wagner	220	1440
3	G.E.	220	1470
3	Wagner	220	1450

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½	Century (Used)	110	1460	$10.
¼	Century (New)	220	1739	17.50 each (3 in stock)

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H.P.	Name Brand	Voltage	R.P.M.	Reg. Price	Our Price
75	G.E. TEFC	220/440	1760	$2,000	$1,300
30	F.M.	220/440	1465	600	395
40	Century—Slipring Type SRT—Hoist and crane duty	220/440	865	1,000	750

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1100-20	37.50	1000-22	33.00
1200x20	48.25	1400x24	110.00

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60-75% TREAD—REG. TYPE

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New S-2 DDPCU Hiel unit. List price $1,310.00. Our price $900.00

SPECIAL

Good used roller shells, shafts, bushings and end collars for D8, 50% discount. We have the largest stock of new and used parts for Crawler tractors in the middle west including rear main frames, motor blocks, radiators, crankshafts, sleeves track frames, rollers, sprockets, idlers and some track. Special unused surplus smooth highloader track for TD9's $500.00 per set.

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Including dryers, aggregate hoppers, storage tanks, bucket conveyors, batch mixers and scales, boiler, pumps, electric motors, exhaust and dust collecting system. Will sell entire twin plant or any part. Structure also available.

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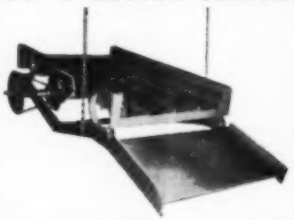

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1951 International T.D. 18 D.D. PCU and angle dozer.
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1948 Slusser McLean 10 yd. scraper.
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K-595 Link-Belt Dragline, with 85' boom, 2½ yd. bucket, D-17000 Caterpillar engine; hydraulic controlled. In excellent condition.

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200 Tons 5" I Beams 10.0# x 40'.....$6.50 Cwt
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3—43 FDT's—GMC Engines .....$12,000.00 ea.

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10-ton General Model 307 Self-Propelled Crane, gasoline powered, 60-foot boom, $11,000.00.

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Engine - Power Unit — Cat Diesel D13000Y, open type clutch, outboard bearing, 18½ x 16" fibre pulley, and safety shutoff group. Runs excellent—looks right. FOB Louisville..$3,850.00

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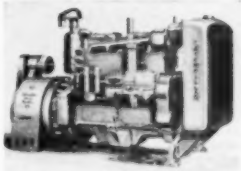

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GMC 650 Diesel 1950 Std. cab, 2 spd. axle, 5 spd. transmission, 11.00/22 tires, complete tractor equipped. Two others similar. $6450

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1 CATERPILLAR #12 Grader,
2 years old—8 T Model.
A-1 condition, Looks like new.
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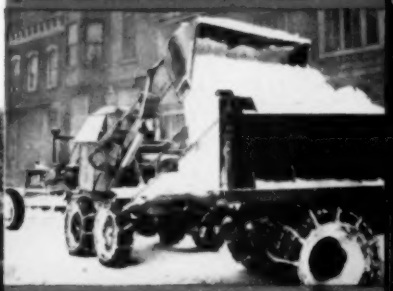
How one community gets

More Miles of Good Roads from Tax Dollars . . .

Galena, Illinois finds that its low-priced Allis-Chalmers Model D Motor Grader speeds all phases of year-round road maintenance, cuts labor costs by more than 40 percent — makes road budgets reach further.

WEEK'S GRADING IN A DAY. The Model D does more grading for Galena in a single day than the old tractor and towed grader did with two men in a week.



SNOW REMOVED AT RATE OF 150 YD. PER HOUR in Galena's business section. Snow is windrowed with grader blade, then loaded into trucks with rear-end loader. V-type snowplow is used on the Model D to open outlying roads.

LOADER SAVES MANPOWER. With its hydraulically operated ¾-cu. yd. rear-end loader, the Model D reduces manpower needs on a variety of material handling jobs. For instance, two men (operator and truck driver) now load a truck in four minutes where formerly it took four men twenty-five minutes.

WORKS ON STEEP GRADES — SUMMER AND WINTER. Many Galena street grades are more than 22 percent, but Tandem Drive and rear-engine design give the Model D plenty of traction to work the year around — removing snow, ditching, shaping, maintaining.

Only low-cost grader or maintainer with Tandem Drive, other Big Grader features. The Model D is engineered from the ground up *as a motor grader* — with none of the objectionable features and handicaps of a converted machine. *Tandem Drive* gives it four ground-gripping contacts instead of two. Other BIG GRADER features include tubular frame, hydraulic controls, engine over drive wheels, long wheel base.

3 Model D's for the cost of 1 Big Grader. A price one third that of large graders makes the Model D the biggest value of all!

More Information

Write for Model D Bulletin and reprint of article *New Equipment Makes Progress and Advances City Standards* for Galena, Ill. No obligation.

the newest, finest line on Earth!

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WEIGHT — 8500 lb.
BRAKE HP. — 34.7
SPEEDS — four forward to 18.6 mph; reverse to 2.9

- designed for your jobs
- built to take it
- easy to operate
- easy to service

For this busy viaduct

a *shock-absorbing* Sheet Asphalt pavement

Constructing heavy-duty Texaco Sheet Asphalt paving on the 35th Street Viaduct in Milwaukee, Wisc. The Schneider-Borchert Construction Company removed the old surface and laid the new pavement without interrupting traffic.

The city of Milwaukee's 35th Street Viaduct is one of its busiest traffic arteries. More than 23,300 vehicles cross over this viaduct in a 24-hour period. As you will note from the above photograph, a large proportion of these vehicles are trucks and buses.

It became necessary last year to remove the viaduct's old, worn pavement. In its place, Milwaukee constructed a dense, resilient Texaco Sheet Asphalt surface. The exceptional ability of Sheet Asphalt to absorb heaviest impact, its freedom from joints, unsurpassed riding quality and low upkeep cost have made it a top favorite among pavements constructed on city streets.

For almost 50 years, American cities have been constructing Sheet Asphalt paving with Texaco Asphalt Cements. In the course of that half century, more than 1,500 representative cities from the Atlantic to the Rockies have paved streets with Texaco. Included among these are most of the leading cities east of the Rockies—4 out of 5 cities having a population over 25,000.

Write for our two booklets which furnish helpful information about Sheet Asphalt and other types of Asphalt paving suitable for city streets.

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